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
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Albert Einstein, maker of universes.



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ALBERT EINSTEIN

MAKER OF UNIVERSES

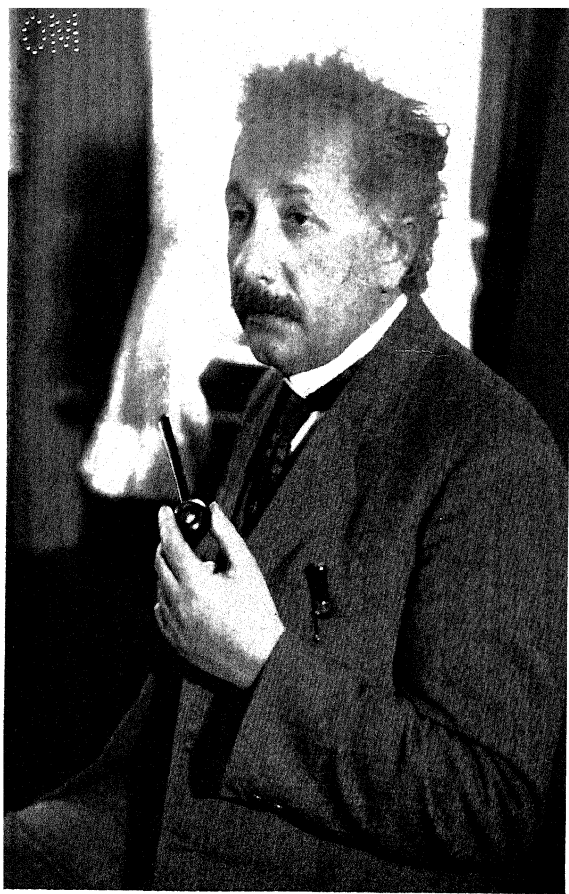


Photo by Ruth Jacobi-Roth

ALBERT EINSTEIN

ALBERT EINSTEIN

MAKER OF UNIVERSES

BY

H. GORDON GARBEDIAN

*Author of "Major Mysteries of Science,"
"The March of Science," etc.*

Those should be the best loved who have contributed most to the elevation of the human race and of human life.

ALBERT EINSTEIN



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FOREWORD

ALBERT EINSTEIN has been called the most loved man and the most stable idol on earth. No dictator can command the homage that millions have freely lavished upon this shy savant whose love of humanity has earned him exile from his native land. His admirers include men and women and children in all walks of life—the janitor, the barber and the waiter who serve him, as well as kings and presidents, prima donnas of stage and screen, noted scientists, and the heads of the most famous learned societies and institutions in the world.

His scientific achievements have won Einstein the title of “the twentieth-century Newton”; and there are some authorities who go even further and pay him tribute as the greatest intellect the human race has produced.

But these scientific achievements cannot be expected to have the same universal appeal as his humanitarian activities, his labors in behalf of world peace, social justice, Jewry, international understanding. For of Einstein, above all other living men, it may be truthfully said: he thinks like a sage, but he feels like a man.

To those who prefer to read the stirring story of Einstein’s life without discussions of scientific problems, the author ventures a suggestion: the theory of relativity and

FOREWORD

its ramifications is discussed only in chapters two and four. By skipping these two chapters, a reader will get the continuous, detailed narrative of the struggles against fate, poverty, scientific jealousy and rapacious dictatorship which have led this man to a unique place in the world today. The author ventures to hope, however, that such readers, when they have concluded the purely biographical part of the book, may be emboldened to return to the volume now and then and dip into the chapters on the theory of relativity, one of the outstanding intellectual achievements of mankind.

My sincere thanks are hereby tendered to Dr. Clyde Fisher, Curator of the Hayden Planetarium of the American Museum of Natural History, and to Harry T. Smith, who have read and edited the manuscript, and to all the other friends and colleagues who have lightened my task with their sympathetic cooperation.

I also wish to express my indebtedness to Professor Albert Einstein, who has given generously of his time and energy to answer innumerable questions and otherwise to extend aid to me in the completion of this book. A vote of thanks is due also to Professor Einstein and to Mrs. Lotte Jacobi for the loan of the illustrations in this volume, many of which are published here for the first time.

THE AUTHOR

ALBERT EINSTEIN

MAKER OF UNIVERSES

I

BEGINNING THE ROAD TO IMMORTALITY

There is a history in all men's lives,
Figuring the nature of the times deceased;
The which observed, a man may prophesy,
With a near aim, of the main chance of things
As yet not come to life, which in their seeds
And weak beginnings lie intresured.
Such things become the hatch and brood of time.

SHAKESPEARE

THE blustery days of early March had gone, and as the sun sank in the western sky where the Iller joined the Danube, the month of storms appeared to have garbed itself in more lamblike attire. There was a mellow freshness in the breeze from the newly reinforced river as it cut a wide swath along the ancient town's waterfront, and a solitary walker eagerly gulped in deep breaths and threw back shoulders that were beginning to show the stoop that comes with middle age and long hours over a workbench.

One of the few commercial vessels that still made use of the terminal facilities of the river port at Ulm was backing into the river, its whistles shrilling, steam up for the 1500-mile journey to the Black Sea. Crocuses were pushing

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their golden-yellow heads shyly above the still frosty greensward, buds on the trees were daily growing larger, and everywhere Mother Earth was responding to the call of spring.

The Danube wore the shimmering glow of sunset as the man turned his back on the majestic river and headed for the modest home street on the other side of town. A carriage full of laughing young people out for a night's frolic rattled by. As he reached the town's famous square, with its picturesque medieval buildings, Venus, glittering like a diamond, shone forth between the Gothic spires of the loftiest ecclesiastical tower on earth, and the crescent moon added new beauty to the stained-glass windows of the cathedral. More than 500 feet above his head, workmen had set their tools aside for the night in the northwestern tower, which, begun in 1377 when Ulm was a famous center of trade and imperial interests, was at last nearing completion five centuries later.

As he walked home under the stars, the mysterious heavens raised once again their perennial riddles: Where and how did so much beauty, all the countless worlds each pursuing its inexorable journey in time and space, and the tremendous variety of life, originate? What was the meaning of human creation? Where did the earth come from; what is the story of creation; what is man's place in the cosmic scheme?

But thoughts of celestial significance were suddenly driven from his mind. For there, in front of his home with all its gaslamps aglow, stood the muddy carriage of the family doctor. It was only thoughts for his wife that filled his mind and made his heart beat with unwonted excitement as he sprang up the steps. They had been waiting for

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him. His flustered sister, and the paunchy, good-humored doctor who liked his beer from Munich were in the doorway, and, thank God, they were smiling! The child had come a little sooner than expected. And it was a boy.

That night, the quiet street in Ulm was the scene of excitement and rejoicing. For in the year 1879, the radio, the moving picture and the automobile had not yet come to rob neighborliness of some of its joys, and the community still found its greatest interest in the doings and happenings of each other. The infant looked hale and robust, and the shining brown eyes in the chubby face inspired callers to assure the proud parents that he would be a pretty child. At last all the neighbors had departed, leaving behind considerable advice and numerous home recipes on the care of new-born infants for the guidance of the inexperienced parents, and the household resumed its normal air of modest comfort and quiet. No one, not even the proud father, as slumbers claimed them all, dreamed that a historic event had taken place, and that the far-flung galaxies were to yield a larger measure of the mystery which cloaked them than ever before at the command of the human being who had come into the world that day.

A stone's throw from the Einstein home was the principal shrine of Ulm. It was the last home of the town's most famous personage—Johannes Kepler. There the famous child of a reckless soldier of fortune and a mother imprisoned for witchcraft had worked during his last years, two hundred and fifty years before the birth of Albert Einstein, to overcome the handicaps of quixotic parents, bitter poverty and physical infirmity, and to for-

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multate the laws which have won him immortality as the founder of physical astronomy. During the fifteen months which followed that eventful March 14 on which Albert was born, the boy's father frequently pushed the perambulator on a Sunday past the historic shrine. When the first year had passed, and the boy still showed a mental awkwardness in learning to talk which forced his parents to consult the doctor, the father occasionally found himself unable to restrain the wistful wish that his young son would demonstrate a little of the intellectual genius with which Ulm's first citizen had been so abundantly endowed.

The years following the end of the Franco-Prussian War saw a tremendous vitality take hold of the newly-created German Federation. More than a billion dollars in gold, extracted from a humiliated France—whose unprepared army had been tricked into untimely war by wily Bismarck—was flowing into the treasury in Berlin and was providing a new impetus in the arteries of trade. The impact of the new prosperity, however, was strongest in the large cities, and the 40,000 middle-class burghers of Ulm derived little benefit from it. Ulm's era of greatest splendor and wealth was behind rather than ahead of it. A son inspired Hermann Einstein with new responsibilities and ambitions, and in the summer of 1881 he decided to move his family and his electrochemical factory to the bustling city of Munich. The sixty-three-mile journey to the Bavarian capital, then as now overwhelmingly Catholic in its population, was negotiated successfully, and the Einsteins settled down in an unostentatious rented house far removed from the gay taverns and the brilliant theaters of the center of the fast-growing city.

From a business standpoint, the change proved to be

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highly successful—though, unfortunately, it was to be the last happy change in fortune which the kindly, optimistic and easygoing head of the family was destined to enjoy. The rented house was discarded in favor of a more pretentious suburban villa, surrounded with gardens and tall trees, between which one could glimpse on a clear day the blue foothills of the Alps twenty miles away toward the Swiss border. In this cheerful bourgeois environment, young Einstein, now with a younger sister who insisted on playing with him, spent the formative years of his boyhood up to his sixteenth birthday. It was a hectic and momentous period which saw vast changes in the new union of the German people, but hardly less profound were the transformations going on in the mind and spirit of the bushy-haired boy, who already was showing signs of the sensitiveness, indifference to social associations, and intense love of solitude which were to dominate his whole life.

Albert was only four years old when the passionate curiosity regarding the workings of Nature, which has been the motive force of his existence, was suddenly set ablaze by his astonished father. In a playful mood, his father one day brought home a new toy for the lad, who lay abed with a minor ailment. The toy was a small mariner's compass. The dancing needle, thought the innocent father, would amuse the ailing child, as tin soldiers and firecrackers brought laughter to other children, until he was ready to play outdoors again. But the effect on the boy was astounding. His brow feverish with excitement, he turned the instrument round and round in his hand, eagerly watching the gyrations of the magnetic needle in its horizontal plane and plying his father with endless

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questions. The unbidden whirling of the piece of steel was to him a miracle, a demonstration of occult, divine power. The shiny toy was his initiation into the mysterious realm of physics, and, instead of providing him with ephemeral amusement, it set him to tossing on his pillow—much to his father's alarm—and yearning for a greater understanding of the incomprehensible web of Nature which enfolds us all.

"Uncle Jake," his father's younger brother and partner in the electrical business, and dearer to the boy than any of his other relatives, helped him in his bewilderment by introducing him to mathematics. Albert's play instincts and introspective habits of mind became more and more absorbed with algebra as he grew older. "When you don't know anything, you just call it ' x ' and then go right ahead and look for it," his uncle said. The idea fascinated him. Before he had attained his teens, Albert could discover for himself the exact relationship between the sides of a triangle, could prove the Pythagorean theorem without help, and was carrying on his game of "numbers" and "algebra" to the point where he was making up absorbing problems for himself. An undying passion for puzzles in an enigmatic world was born in him. It was his first passion, and it grew with the years as the problems he tackled grew more intricate and embraced more and more of the universe.

But, meanwhile, his parents had started him in school, and his progress there was satisfying neither to his teachers nor to his parents. He was six years old when he entered the German primary school and nine when he began his secondary school education at the Luitpold Gymnasium in Munich. Albert hated compulsion of any sort,

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and he could not discipline himself, as did the other students, to follow the educational ideals set forth by his instructors. Learning by rote, with emphasis on the mechanical rather than the spiritual, bored him, and he frequently gratified the urge to ramble into the romantic countryside when his parents thought he was in school, just as today he will sometimes play truant from his office in Princeton, slip away to the green countryside, and swing his legs as he balances himself on a railroad track, lost in contemplation of a realm where no one can accompany him.

The German instructors impressed young Albert as militaristic martinets. They would have been excellent second-lieutenants in the German army, but they failed to inspire him with a love for learning. His teachers, on the other hand, looked upon the shy boy, who was slow of speech and rarely could give the right answers to their questions, as somewhat stupid. Harsh words and whipping with a cane kindled no lasting affection for studies of the ancient world, of the Greek and Latin languages, or of abstract ideas which seemed only to exact servitude to dead concepts. There was, however, one teacher who was able to inspire the spiritual as well as the mental energies of the boy, and for him Albert developed an immediate friendship and respect. Ruess by name, this man fired the boy's imagination so that he was able to overcome his innate timidity and glow with enthusiasm for the beauties of the classical world, for the fundamentals of art, for the creative spirit and the mighty artistic forms of Goethe, Shakespeare and Schiller.

Wishing to express his gratitude for the spiritual inspiration which Ruess had first kindled in him during his

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tender years, Einstein in later life paid his boyhood teacher an unexpected visit. He was then thirty years old, and a renowned professor in the University at Zurich. There had been only one teacher in his school career who had been able to make of education something more than a burdensome duty, to warm his heart and his mind, and now that he was old enough to appreciate how much that service had meant to him, he wished personally to thank the humble instructor.

He walked with a broad smile and outstretched hand into Ruess's classroom. The smile froze on his face, however, when he discovered that his erstwhile teacher did not recognize him and mistook him for someone who had come to borrow money! The visitor stammered the purpose of his visit, but it was not customary for former pupils in Munich to visit teachers except in time of need. As a rule, the German system of formal education made them glad to get out of school and to forget their educational associations as quickly as possible. Was it possible that the young professor had been a pupil of his? What did he want of him? He trusted that his visitor was healthy and prosperous—and, assured that he was both, and therefore not likely to make any demands on his purse—Ruess began to relax and grow more friendly. But by that time his mortified admirer was making ill-disguised excuses to end the embarrassing visit.

One of the two great causes which were to be closest to Albert Einstein's heart throughout his adult years was brought home to him one day in school. The instructor, who, like the vast majority of Munich citizens, was a strong Roman Catholic, displayed to the round-eyed students a large nail which he said was used by the Jews to

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crucify Jesus Christ on the cross. The unfortunate episode let loose the venom of anti-Semitism, and young Albert, whose lack of a "clubby" feeling and a distaste for sports had prevented him from becoming a close friend of any of the other boys, was now made to feel his isolation more intensely than ever before.

It was the bitterest experience of Albert's boyhood, and he never forgot it. His lifelong interest in the movement for Jewish liberty was constantly warmed by the memory of the deep scar wrought in his youthful feelings by the thoughtless attitude of his schoolday teacher and classmates. Mature experience convinced him that history had given the oldest of living peoples "a difficult row to hoe," and he never hesitated to proclaim that "an almost fanatical love of justice and the desire for personal independence are features of the Jewish tradition which make me thank my stars that I belong to it." His espousal of Judaism was to confront him with a tragic decision in later life, when the cause of the Jews and his other great cause, peace, seemed destined to turn against each other after Hitler's capture of Germany.

In the year 1888, Munich, like other large German cities, was almost overwhelmed with pageantry and an infinite variety of parades. For in that year, within the short period of twelve months, the throne of the empire was occupied by three emperors—William I, the Prussian king with whose eager encouragement Bismarck fought Napoleon III for the rich provinces of Alsace and Lorraine; the ill-fated Frederick III, who reigned for only ninety-nine days before being gathered to his fathers; and, finally, William II, who began his long rule by getting rid of the mighty Bismarck and ended it in Doorn by

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chopping wood and meditating on the quirk of fate which had taken his empire from him and given it to an obscure Austrian.

Trumpets blared and regiments in colorful uniforms goose-stepped almost daily along Munich's streets, particularly on the famous Ludwigstrasse, from the picturesque Siegestor at one end to the Feldherrenhalle, or Hall of Marshals, a faithful copy of the Loggia dei Lanzi at Florence, which stood in all its Renaissance splendor at the other. Albert was only nine years old, but, unlike other children, he found no lure in military pageantry. The roll of drums, the clatter of cavalry, the columns of solemn men marching with machinelike precision, and the sight of naked steel with which men destroyed other men, filled his boyish heart with hatred and fear. He was terrified by the thought that he, too, would some day be conscripted into the army, and he dashed home after each ostentatious display of German military power to plead with his parents to save him from that fate. His anguished appeals finally extracted from his bewildered mother and father the pledge that somehow they would see to it that he was not forced into military service, even if they had to take him far from his native land.

The shy boy, deprived of the normal social contacts of other youths, found his most satisfying pleasures in the simple, intimate circle at home. His mother, whose maiden name was Pauline Koch, came from the small town of Cannstatt in Swabia, while his father was born in Buchau, not far away, in a region famous for its lovely landscape. They had settled in Ulm shortly after their marriage. Both parents spoke a South German dialect, and both were intensely devoted to their son and their

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daughter Maja, two years his junior. The mother, wrapped up in her children, her housework and her neighbors, and the father, a generous, kindly and optimistic soul who found great favor in the eyes of all acquaintances, particularly the women, were ideal parents. Cheerfulness, comfort and serenity blessed the pleasant Einstein fireside in those days, and provided healing for any wounds which Albert suffered in his contacts at school and elsewhere. The boy's backwardness in school and in sports sometimes made his father fear that his eldest child might be abnormal, but the mother never failed in her lavish devotion to her son and often prophesied that "some day Albert will be a great professor."

The simple, retired life of the Einsteins frequently included a Sunday outing to the green mountains and the sylvan Bavarian lakes near Munich. Sometimes Elsa, a distant cousin and many years later Albert's wife, went along with the parents and their two children on these picnics. But what Albert enjoyed most were the carefree evenings of music at home, when some of the engineers employed in his father's factory gathered around his mother at the piano to sing and play—especially when she played the classical music of Beethoven. Albert himself started to take violin lessons when he was only six years old, and as he grew older music became for him an outlet for surplus energies and for his play instincts, but, above all, a source of never-failing spiritual exaltation. The passion he felt for mathematics was shared by music, and even in his youth he felt an interrelationship between the two through their common aim to express the unknown. This spiritual elevation fed his love for Nature and in-

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spired a profound feeling of adoration for the majesty and mystery of creation akin to religious awe.

Albert's religious education was paradoxical. During the day, he received the training of a Catholic school, and in the evening his parents taught him the tenets of the Jewish faith. The difference between the two creeds did not trouble him; in fact, he concluded that there was a remarkable similarity in the fundamentals of both faiths. To the adolescent youth, God was identified with Nature, and Nature was all-embracing. His father, a freethinker who was ironic about the dogmatic rituals of religion and friendly to the philosophy of materialism which was then the vogue, frowned upon the practice of Jewish religious rites in his home. But Albert, in his own unsophisticated way, sought to give expression to his religious love and awe of superhuman power by writing and setting to music brief songs in praise of God and Nature. At play at home, or rambling aimlessly along the streets and countryside by himself, he would chant these musical creations while pondering on the beautiful, wonderful, awe-inspiring, mysterious world about him.

This worship of Nature became even more deeply rooted in him after a dinner party in the intimate family circle. Each Thursday a poor Jewish student in Munich was invited to partake of the generous hospitality of the comfortable Einstein home, and on one of these evenings the guest was a medical student from the near-by University of Munich. Although eleven years Albert's senior, the medical student admired the boy's intelligence, and a strong bond of friendship—the only one of Albert's boyhood—was cemented between the ten-year-old boy and the collegian. For five years, Albert and Max Talmey were

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intimate friends and close intellectual comrades, until the latter departed for New York to carve out a medical career while the Einsteins set their compass southward in an effort to recoup the family fortunes.

During that momentous period in Albert's intellectual and spiritual development, Talmey played an important rôle. Not even the fond egotism of parental love had led Albert's parents to suspect that in their son they harbored a mental Hercules. But the medical student sensed the extraordinary quality of the boy's mind, and where others had rebuffed or merely tolerated the unquenchable inquisitiveness of the sensitive youth, he actively encouraged it. In Albert's ability to discuss intelligently subjects which provided a serious hurdle even for the average university student, Talmey glimpsed a clue to his unique destiny. As a gift for Albert's promotion from the third to the fourth class in the Luitpold Gymnasium where he went to school, Talmey gave him a copy of Spieker's Geometry. For weeks thereafter, the boy was absorbed in its contents. Fascinated by this book as other youths might have been by a pretty girl, he buried himself in his little study, emerging only to attend school and at his mother's peremptory call to meals.

Each time Talmey called, Albert showed him with great delight the new problems he had succeeded in solving. With an occasional bit of advice from Talmey, Albert demonstrated his genius for mathematics by mastering the whole book within a few months. The experience whetted his appetite for more, and he devoured books on mathematics with the same insatiable passion that other boys indulged in reading Indian tales and adventure stories. The perfect harmonies of mathematics provided

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him with the most exciting adventures of his adolescence, a spiritual tower-room where he could allow his creative fancies fullest freedom. He experienced a feeling of esthetic pleasure at the concept of a world which could be explained by this science of measurement, by theorems, by parallel lines that did not meet, and by geometrical constructions that were purely products of the human intellect. In him it stirred emotions such as a reverential visitor may feel at the sight of a magnificent cathedral. Within two years, Talmey was no longer a match for the twelve-year-old boy, and at the age of fourteen Albert was already master of the higher mathematics which the secondary school did not even teach. The flight of his mathematical genius was so swift that he was able to conquer integral and differential calculus as well as analytical geometry and algebra by himself and to amaze his nonplused teachers with his talent.

To the disconcerted instructors, who had regarded Albert's deficiencies in foreign languages, geography and history as proofs of subnormal intelligence, this amazing talent was not altogether pleasing. It became even less so when the inquisitive boy's artless questions embarrassed the less-equipped professors into silence before a classroom of wondering students. Finally, a perplexed professor called him to one side and pleaded with him not to put him to shame in public by propounding questions which he was unable to answer!

Two other works, both covering subjects not included in his secondary-school curriculum, acted like beacons to Albert's creative spirit: Buchner's *Force and Matter* and Aaron Bernstein's *Popular Books on Physical Sciences*, which depicted physics and physical phenomena

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vividly and attractively. Bernstein's discussions of physics made a particularly profound impression on the acute mind of the youngster who was destined to become the greatest physicist of his age. Quick to rebel at the drudgery of school, he was an eager slave to his own studies of physics and higher mathematics. Forty years later, when visiting New York with Mrs. Einstein, he called on Talmey to thank him for the books which had exerted "a very great influence" on his "whole development." Albert never read any light literature, and when only thirteen years old manifested his enduring interest in philosophy by beginning to read Immanuel Kant.

The abstruse teachings of the founder of the critical system of philosophy—written in "the packing-paper style," according to Heine—are incomprehensible not only to children but to most adults. But Kant's complex doctrines calling for a searching analysis and skepticism of human experience, his agnosticism and his conviction that sense perceptions are activities of the mind which we transfer to Nature in the process of knowing it, appeared to be perfectly clear to the thirteen-year-old boy. He read through many times Kant's *Kritik der reinen Vernunft* and other philosophical writings, and discussed with his friend Talmey at great length the philosopher's observations concerning the objective and subjective attitudes toward knowledge. The seeds of that remarkable self-detachment in his work, which all observers have detected in Einstein, were planted in his fertile mind during this period and came into full flower during middle age, when he could survey Nature and his own original approach to its mysteries and its laws with unruffled calmness while

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himself occupying the center around whom bitter controversy raged.

While Albert continued absorbed in mathematics, physics and philosophy, a profound change was taking place at home. His mother frequently greeted his father with anxious commiseration when he came home for dinner, and deep frowns on the latter's brow often took the place of the jovial laughter and carefree frolicking with his children which he loved so much. Although every effort was made to hide the worries of the parents, the children began to notice the change. To Albert, accustomed to the solid comfort and serene wellbeing of a modest bourgeois home, poverty had always seemed a brutal and tragic injustice. In school, there was a marked difference between the deferential manner which the instructors showed to the children of rich parents and the contemptuous indifference with which they treated the poor. Moreover, the well-to-do boys and girls were able to escape from the gloomy atmosphere of the large, overflowing classes in the Munich schools to ease and brightness and good cheer; to them, comfortable homes within sight of the beautiful structures of the Middle Ages, the Rococo and the Renaissance in the new part of the city, gay theaters and joyous parties offered refuge and diversion. But the children of the poor had no escape from the gloom and lovelessness of school. They fled from the hard brutality of unsympathetic instructors and a harsh militaristic school system to the careworn, dingy poverty of rickety wooden buildings in the ancient part of the town which stood then much as they did when the Austrians were in possession of Munich in 1742. The Einsteins, with their sharpened social sense, had always been ready

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to extend quiet aid to those less fortunate than themselves, and Albert's boyish sympathies were never more easily aroused than by the sight of human suffering due to poverty in the midst of a city of great riches.

But now the wheel of fortune had taken a sudden and unpleasant turn, and Albert and his parents were to need some of that warm sympathy which they had readily lavished on others. His father's electrical engineering plant, which had been prosperous for almost fourteen years after the removal from Ulm, began to suffer one unfortunate mishap after another. In spite of everything he could do, the business declined until there appeared to be no alternative to hopeless bankruptcy. There were endless family conferences, and the parents at last decided to give up their residence in Munich and begin a new life in Italy, where cousins of the family were doing well. Leaving Albert alone in the pension of a friendly old lady to complete his schooling, the mother and the father and their twelve-year-old daughter departed for Milan.

Albert's hatred of the regimented school system of Munich with its "generals" in each classroom had increased rather than diminished with the years. But while his parents were in Germany, he had a refuge in the home fireside where he could pursue his own inclinations amid an environment of comfort and parental devotion. But now that was gone. At fifteen, he was alone for the first time, without friends at school to alleviate his gnawing loneliness. Meanwhile, the letters from Milan painted an alluring picture of friendly, carefree Italians who sang in the streets, of a magnificent cathedral which held 40,000 worshipers at one time, of mulberry trees, of warmth. This all spelled freedom to the imaginative youth who

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had never been on a long journey, and he found the lure irresistible. He determined to run away, to cut short his preparations for the final examinations at the Luitpold Gymnasium, and to join his parents in the Italian paradise.

But that decision was more easily made than put into effect. To Albert Einstein's naïve, open-as-day character, deceit of any kind has always been one of the most detested evils. But the militarized education of school was even more intolerable. With many pangs of conscience, he planned a boyish deception in which he obtained the co-operation of a friendly doctor. A certificate was prepared bearing the doctor's signature stating that Albert's health was seriously menaced by nervous exhaustion and that a leave from school was essential.

He suffered from a strong feeling of guilt, the conviction that he had been untrue to his high ideals in winning his freedom with a lie, as he boarded the train in the giant railroad station for the 200-mile trip to Milan; but exultation and excitement for the nonce drove other thoughts from his mind. The train that chug-chug'd out of the station left behind a school and a city in which he had never been really happy. He had burst the chains of intolerable authority. He was free, and the future beckoned with a smile!

A few years later, another youth, a pale and somewhat anemic carpenter, was to steam into the same station, dreaming not of service to humanity, but of self-aggrandizement based on military might and tyranny. He had never heard of Albert Einstein, and Einstein was equally unaware of his existence. Both young men were obscure nobodies, and neither dreamed that their paths would

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cross with an explosive effect that would be felt the world over. But Einstein's theory of relativity, and Hitler's putsch—which were to set off revolutionary movements in such widely separated realms—were events of the unseen future as the train sped toward the snow-peaked Alps on its way to the sun, the color, and the freedom of Italy.

The next six months were the happiest of Albert's boyhood. There were no clouds of educational compulsion to mar his sky, and his days were spent enjoyably in walking through the fertile garden spots of Lombardy, with their endless rows of poplar and mulberry trees, in visiting cathedrals and museums with their riches of medieval and Renaissance art, and above all in passionate reading of the subjects which appealed to his powerful and original mind. Unlike Munich, where sudden changes of temperature, especially toward evening, made one liable to colds, Milan had a warm, pleasant climate which appealed to him tremendously. And the appeal of the spiritual climate, of the carefree gaiety, the love of song and beauty, and the uninhibited, vivacious and natural mode of life of the Italians was just as great to his freedom-loving, restraint-hating spirit.

During one of his long hikes, which took him on a visit to friendly cousins in Genoa and a glimpse of the sunlit Mediterranean, he resolved to give up his German citizenship. He was not sixteen, and during the next five years he was a man owing fealty and obedience to no country, a human being completely free from national, social and racial ties, a citizen of the world. He was completely happy in his new-found freedom, and his happiness could not be spoiled even by the life of hardship and bitter struggle against Dame Fortune's adversities which set in.

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The elder Einstein had started his electrical engineering business anew in Milan, in the midst of 800,000 Italians engaged in bringing new wealth to Italy's richest manufacturing and commercial city, and later in Pavia, but his ill-luck was relentless. The persistence of financial misfortune created a crisis in family affairs, and the emergency was the turning point of Albert's career. His parents advised that the time had come for him to buckle down, to choose a profession, preferably the position of engineer which his father's calling and his own mathematical abilities indicated as most suitable, and to settle down to a practical life of self-support.

But the idea of being "practical," of pursuing a mechanical routine of employment in some business office for material profit, made young Einstein's highly idealistic, gypsy nature flinch. His material desires were few, and poverty, therefore, was not a very serious burden to him. He felt no ambition for fame and riches, for glorified success. Such familiar goals left him cold and antagonistic. Others could hunt with rush and bustle for the illusory blessings of fortune; all he craved was a modest intellectual life with leisure and solitude to study and understand, to delve for the inward riches of the mind, to pursue the visions which had taken hold of him and placed the heavy weight of a mysterious universe upon his young shoulders.

Somewhat in the same spirit which led Emerson to observe that if a man plant himself indomitably on his instincts, the world will come round to him, Albert continued to abide in his dreams and postponed the day when he must grasp the bull of his dilemma by the horns. In any event, a university education was a primary req-

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uisite to any professional career. He had brought one possession with him from Munich which he valued highly, a certificate from one of his teachers at the Luitpold Gymnasium paying high tribute to his mathematical talents. Armed with this testimonial, the dreamy youth knocked on the door of the Polytechnic Academy at Zurich, Switzerland, for admittance. His premature departure from Munich, a few months before the conclusion of his secondary-school education there, had deprived him of the graduation diploma which would have admitted him to the Academy, but he hoped that he would be permitted to take an entrance examination to make up for this deficiency. His request was granted. Absent for nearly a year from instruction, he sat down courageously and eagerly to the test. His success with physics and mathematics astounded the professors—and his inglorious failure with the examination on languages and natural sciences saddened them. The audacious student was advised to complete his secondary-school training at the cantonal school in Aarau, and to come back to the Academy.

Aarau, capital of the Swiss canton of Aargau, was a small town located on the right bank of the river Aar at the southern foot of Jura, thirty-one miles northwest of Zurich. An ancient fortress, which at one time was the capital of the Helvetic Republic, it still was an important military center. Unlike Munich and Milan, each a thriving commercial metropolis, Aarau was a quiet place with a population of less than 10,000 persons, most of whom were German-speaking Protestants. When Albert arrived at the new school in the fall of 1895, his mind was full of fears based on Munich memories, but he was immediately

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captivated by the tranquil existence and friendliness of the people, and the free, liberal and cosmopolitan atmosphere of the school. The system of instruction resembled university lectures, and the instructors were kindly, enlightened human beings with a modern point of view, who depended little on authority and compulsion in their teaching methods. To Albert this was a pleasant and stimulating surprise, and he set to work with zest to obtain the knowledge of foreign languages and the natural sciences which he needed to enter the Academy at Zurich.

In this atmosphere he lost some of his shyness and love of seclusion, and for the first time had a number of friends of his own age with similar inclinations. One of the teachers at the cantonal school, a Professor Winteler, took a special liking to Albert, and invited him to make his home at the Winteler residence. There he met the professor's daughter, an attractive girl who fascinated the boarding student and aroused, for the first time, unsuspected romantic notions in him. The professor also had a son, who became Albert's closest friend. The two youths, together with the father and the girl, made a familiar quartet in the picturesque village, and on holidays frequently went on outings together to the beautiful countryside around Aarau. Under the kindly tutelage of the professor, who taught German and history in the classroom, these jaunts became more than pleasant outings; they sharpened Albert's increasing intimacy with Nature and instilled in him a deeper sympathy for and understanding of human affairs. The ties of friendship between Albert and the Winteler family became even stronger after the professor's son had met Albert's sister

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Maja. The two fell in love, and in time Albert had a brother-in-law as well as a friend.

Within a year of his arrival at Aarau, Albert had completed his preparatory studies and obtained his matriculation certificate without difficulty. He sadly bade the Wintelers good-by, and renewed his knocking at the doors of the famous Academy in Zurich. This time he was cheerfully admitted as a full-fledged student. The intellectual fame of Zurich was almost as great as its renown for beauty. One of the most beautiful cities in all Europe, Zurich's location on both banks of the Limin as it issues from the lake afforded glorious views on all sides. With true Swiss industry, the 150,000 inhabitants had heightened the beauty of nature's breath-taking vistas of lake and mountain with stately buildings and artfully landscaped gardens. Almost everyone spoke German—indeed, Zurich was the intellectual capital of German-speaking Switzerland—and many spoke French and Italian as well. The Academy reflected this cosmopolitanism. Its students had come from all parts of the world, and its teachers included many men famous for their learning far from the boundaries of the picturesque lake.

No one could help being deeply impressed by such surroundings, and Albert's sensitive spirit reacted with characteristic vigor. He plunged headlong into the study of mathematics and physics, and under the inspiring influence of such men as the physicist Weber and the talented mathematicians Gayser and Minkowski read day and night. The germs of the epoch-making theory of relativity were already taking root in his fertile mind, and the teachings of Gayser and Minkowski—the latter of whom was to make an extremely important contribution to his seven-

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teen-year-old pupil's investigations ten years later—were subsequently helpful in the formulation of his revolutionary hypothesis. The world-famous scientific courses at the Zurich Academy soon appeared inadequate to the budding genius, and he frequently cut classes so that he might study on his own the fruitful work of Hertz, Helmholtz, Kirchhoff and other great physicists.

His scientific development was now going ahead by leaps and bounds. But his growth was not limited to science. The appeal of all Nature, the keen desire to comprehend the universal, to exercise all the facets of the human spirit, were even more powerful than during his boyhood. During the four years which he spent at the Academy, his mind and spirit, no less than his body, flowered into strong and flourishing maturity; with a religious fervor he read Darwin and Ernest Mach, Schopenhauer and Hume, in addition to Kant, but his giant appetite for understanding remained unsated.

He had also developed the faculty of making friends with kindred spirits, and several of the students at the Academy played a vital rôle in his life. One was a talented girl from Serbia named Mileva Maric, who shared Einstein's enthusiasm for mathematics. The two frequently studied together, and this companionship added more and more to Mileva's interest in mathematics, and particularly in one mathematician, much to the delight of Albert, who sorely felt the need of a woman to take care of him. Before they had concluded their school careers, this promising friendship had ripened into an engagement. Another close companion was Marcel Grossmann, a young man who, like Einstein, was endowed with an intellectual passion. Fifteen years later, when Grossmann had become

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a well-known professor, he was to act as one of Einstein's collaborators in defining the mathematical basis for the general theory of relativity. The two students shared another interest—a "practical" interest which strikes a sympathetic chord in the hearts of all collegians. Grossmann kept excellent lecture notes, and to Albert, who had got into the habit of cutting classes whenever in the mood to pursue his own studies, his friend's industry provided a convenient way to rectify the omissions in his education caused by such absences, especially when examination time approached.

The sparks of Albert Einstein's interest in economics and social justice were kindled into an enduring fire also during his collegiate career. One of his fellow students was Friedrich Adler, an impulsive blond youth from Austria, who was the most ardently idealistic soul Einstein had ever encountered. A physicist, Adler was also a leader of the international social-democratic movement, and his militant hatred of human exploitation made him appear as a saint in the eyes of the idolizing Einstein. The Austrian Socialist, who many years later made the front pages of the world's newspapers when he shot and killed the Austrian Prime Minister Sturgkh in 1916 as a protest against the war, was zealous and patient in turn in his eager effort to transfer some of his enthusiasm for economic reform to his good friend Einstein.

Albert's love of music and his own musical talents were also growing. At Zurich, he became a frequenter for the first time of the opera, and the opulent musical stagings fired his imagination. He dashed home often from the opera, or, when increasing financial difficulties made it necessary to curtail his opera attendances, from a skimpy

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dinner, to improvise fantasies which he played in a sort of monologue to himself. As his skepticism of time-honored traditions in science and research and life in general grew, he turned more and more in his desperate solitude to his violin for comfort and inspiration. His violin nourished as nothing else did the empire of his mind and gave wings to those far-ranging speculative thoughts which now had become his constant companions.

These were years, too, during which Einstein frequently was tempted to take issue with the savant who has observed that of all the advantages that come to any young man, poverty is "demonstrably" the greatest. Sickness and persistent misfortune had reduced the elder Einstein to a state where he could no longer give anything toward his son's support. Relatives of the family contributed one hundred francs—about twenty dollars—a month for Albert's education. Of this small sum, the young student set aside twenty francs to pay for his Swiss naturalization papers. He had developed so strong a liking for the thrifty Swiss and their picturesque, mountainous land that he had decided to live among them after his graduation from college, and with this end in view had decided to become a citizen of Switzerland. With the diminutive allowance of twenty francs—about five dollars—a week, plus the little he occasionally earned by tutoring in mathematics and physics, Einstein had to put himself through college.

Fortunately for him, he had no expensive tastes. He had no desire for lavish entertainments, costly parties or gay clothes. The glances which the coeds threw in the direction of the handsome young mathematician—whose

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good looks were enhanced by an embryonic mustache—flattered him, but had no other effect. If his dollars were few, so were his wants. But there is a subsistence level below which no one, no matter how modest his tastes, can go without real hardship. Einstein never complained, but his meager finances frequently pushed him into prolonged bouts with malnutrition, and the inadequate nourishment with which his growing body had to be satisfied in these college days led to open rebellion of his stomach in later years.

But it was nourishment of the mind, and not satisfaction of the stomach, which continued to engross Einstein. The fog of visions and far-reaching ideas in which he had been struggling for many years was beginning to clear, to provide a path of piercing light through an uncharted wilderness which he was to follow in another few years to undying fame. He had already become profoundly skeptical of the traditional techniques of science and of the intellectual processes of most scientists. He was firmly convinced that observation and experimentation provided the only sure approach to the knowledge by means of which we achieve a greater understanding of Nature and reality. And he proposed to put this conviction to a test by a laboratory experiment.

The mystery of light, the radiant energy which has invested the universe as with an incandescent mantle ever since Creation, had gripped Einstein's mind, never to let it go, when he was still only a sophomore. He debated in his mind the two contradictory explanations of light—which the more reverent have called "the shadow of God"—over and over again. Newton's corpuscular theory was contradicted by the newer hypothesis which viewed

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light not as minute particles of matter but as an infinite series of waves transmitted from luminous bodies to the eye by the undulatory or vibrational movement of the ether.

Einstein wanted to study this perplexing problem with an ingenious apparatus. He wanted to measure the path of a flash of light from one point on earth to another. While this flash of light was traveling from one position to the other, the earth in its rapid journey around the sun would have moved a perceptible distance. On the theory that light travels through a motionless ether, the path of the ray should appear to be slightly curved, Einstein argued, just as a stone thrown from a speeding train appears to curve toward the rear of the train. He placed his proposal before his teachers, pointing out that the experiment might yield new knowledge about the relationship between light, ether, and the earth's movement. Neither they nor their pupil had heard of the similar experiment by two Americans twelve years earlier. Some of the more unsympathetic teachers were made scornful by the novelty of Einstein's idea, while the less skeptical pointed to the great cost of the test and advised Einstein to pursue his studies along "more practical" lines. But the problem of light had moved into Einstein's mind to stay forever; and when shortly after graduation he became acquainted with the now famous Michelson-Morley test, the results of which had made the bewildering riddle of light even more mysterious than before, he plunged into his investigation with renewed vigor, convinced—and, as events were to prove, convinced with complete justice—that he was on the trail of modern science's most far-reaching exploration.

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The towering elms and the spreading maple trees along Zurich's elongated lakefront had changed to bronze and gold and red when Albert Einstein, in the autumn of 1900, at the age of twenty-one, received his sheepskin and the congratulations of the more friendly professors. The time had come for the youth to stand on his own feet, to free himself of the charity of his relatives, and to extract from a brutal, selfish and practical world the means for self-support. To him the prospect of mingling with the avaricious external world was still a dreadful specter. But there was one hopeful alternative. Like Pasteur, Einstein wanted to teach. A teaching post would provide an opportunity to earn a modest livelihood while enabling him to pursue his own original researches, and the high honors with which he had passed his examinations encouraged him to hope for a position on the faculty of the Academy. Several of his professors, impressed with the originality of Einstein's mind, had indicated that the post of an assistant professor would be available to him after graduation.

It was, therefore, with a light heart and a quick step that he called on his former professors after the dignified ceremonies of commencement were over. The vanity and glamor of good clothes had never bothered him, but he dressed that day with special care in the threadbare gray suit which had just received its first press in months. Much depended on the outcome of the meeting for his whole future life; and the dejection which struck him at the sight of his shabby clothes was alleviated by the thought that soon he would be in a position to equip himself with a new wardrobe. His professors were delighted to see him. They liked and admired the passionately

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thoughtful young man, and predicted a bright career for him. But when young Einstein, himself "practical" for the nonce by the force of circumstances, recalled the promise of the assistantship the reaction was bitterly disappointing. Some members of the faculty had been harboring the green-eyed monster of jealousy. Several others, influenced by Einstein's Jewish background, were inclined to consider the applicant through glasses which magnified his faults while increasing their own superiority.

It was a cruel and unexpected blow, and for the next six months Einstein remained in the ranks of the unemployed, a poverty-stricken youth tossed about on the waves of uncertainty and discouragement. The advertisements for help in the daily newspapers became his primary concern until by a fortunate chance he obtained the position of a substitute teacher in the technical school in Winterthur, a flourishing industrial city in the Töss valley about seventeen miles northeast of Zurich. Winterthur was an important junction for seven railroad lines, and its population of 20,000 was growing rapidly under the stimulus of industrial and commercial activity. When Einstein arrived hopefully at the school, he found that the students facing him were for the most part older than he, and poorly educated in academic training, but particularly well in the school of hard knocks. The wide disparity in age and background created an atmosphere which at first made life extremely unpleasant for the timid young academician from Zurich. But a thorough knowledge of a subject gives unmistakable power to a teacher, and even Einstein's rough-and-ready pupils soon came to respect him as a person who, in spite of his extreme youth,

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had the power to give them knowledge and, what is far more important, inspire them with the desire to learn. Even at the age of twenty-one, Einstein's mind gave off sparks which would set other minds on fire.

Within a few months his tenure as substitute teacher was over and he had to hunt another position. One of the help-wanted advertisements that he answered was from a grammar-school teacher in Schaffhausen, a small resort town on the right bank of the Rhine in the North, less than five miles from the German border. The teacher needed a private tutor for two boys who were staying at his pension, and Einstein eagerly applied for the opening. He was quickly accepted, and once again he had the opportunity to reveal his rare equipment as a teacher and his equally rare training for practical life.

Einstein and his two pupils immediately became good friends. The youngsters were bright boys whose interests and affections were easily lured by the kind-hearted tutor who was a veritable walking storehouse of information. No question that they asked failed to elicit a satisfactory explanation. The tutor and his eager, round-eyed pupils found each other's company highly enjoyable and stimulating, but the very congeniality of this relationship led to Einstein's downfall. He sought greater responsibility than he was being paid to assume, proposing the naïve plan that the boys be freed from the restrictions of the pension in order that they might work wholly with him. This innocent proposal angered the master of the pension, who thought he detected a plot on the part of his subordinate to steal the boys away from his influence. Einstein was immediately fired, and his hatred for the brutality and injustice of the "practical" world, which

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had begun to develop in his Munich schooldays, became intensified. For now he witnessed poverty and oppression, not from the safe refuge of a comfortable bourgeois home, but from a cold sidewalk and a penniless pocket.

The story of his sad plight reached the ears of the friend and former classmate at the Zurich Academy who had shared his lecture notes with Einstein. Marcel Grossmann pleaded with his father to help Einstein in his desperate situation, and the elder Grossmann responded by penning a warm letter to Director Haller of the Confederate Patent Office at Berne recommending the talents of the castaway scholar in the highest terms. The result was a friendly communication from Director Haller requesting Einstein to call for an interview.

With a black bag holding his scanty belongings in his hand and renewed hope in his heart, Einstein arrived in the political capital of the Swiss Confederation. It was a pleasant, sunny day on which his train steamed into the station of one of the world's most picturesquely situated cities. The River Aar, which curls around three sides of the high plateau on which Berne's magnificent residences and stately government buildings are perched, glistened under the warm sunlight, while the snowy Alps of the Bernese Oberland stood near by in all their eternal beauty like sentinels guarding the destinies of the capital. The cloudless skies acted like a bracing tonic on the nervous Einstein. Perhaps they were an augury of better days ahead; perhaps the leaden skies which had been his horizon for so long were about to break, too, and some of the sunshine of economic security would filter into his poverty-harassed life. He fervently hoped so, as he anxiously walked into the Government Patent Office.

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Director Haller turned out to be a kindly, good-humored old man, with a broad knowledge of economic as well as of scientific subjects, particularly those of a technical nature. He had no inkling that he was about to play a momentous part not only in the life of this painfully nervous young man but also in the history of science. The job of a patent examiner paid a small salary, but one which to a man in Einstein's situation obviously would prove a godsend. Haller examined the young man brusquely for two hours. The examination revealed some glaring errors in technical matters, but Einstein's judgment, his wide knowledge of scientific problems, and his quick appraisal of the inventions for which patents were desired made a favorable impression on the logical-minded director, whose sympathies had already been touched by the applicant's plight. So in the fall of 1902 Einstein entered upon the career which, before its abrupt conclusion three years later, was to provide the opportunity for his genius to mature and to give to the world one of the greatest achievements of the human mind.

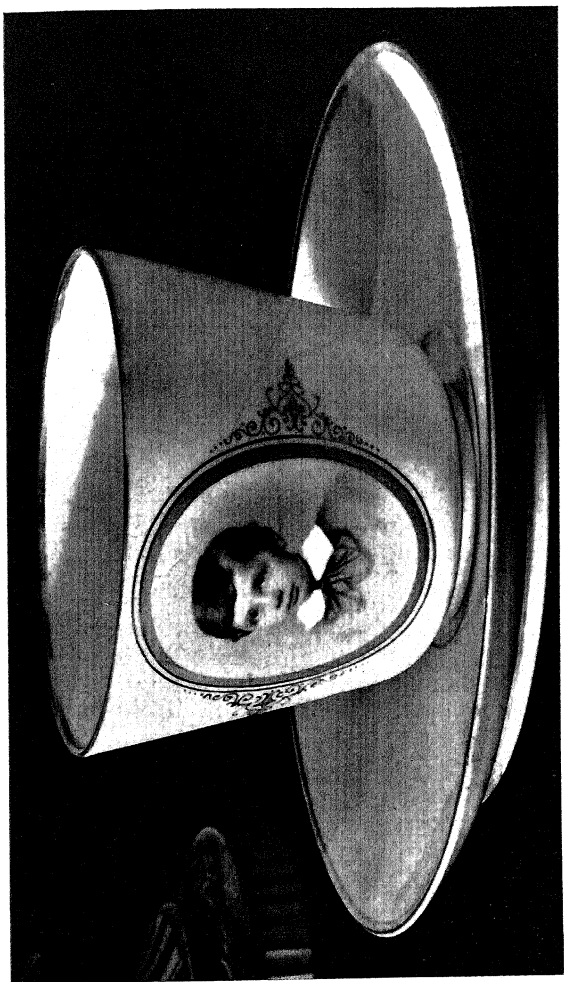
The figure of this intellectual giant toiling at the monotonous routine of a patent office, laboriously examining the designs and models of ambitious inventors in an effort to prevent infringement, perhaps presents as paradoxical a picture as that of Robert Burns acting as excise-man while becoming the national poet of his much-loved Scotland. But Einstein was not depressed by the repetitious routine. The humdrum, matter-of-fact existence was a welcome counterpoise to the feverish whirling inside his brain. The work of the patent examiner was a "shoemaker's" job. It maintained his inner freedom and frequently revived his creative genius by forcing a rest upon

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his ravenous appetite for intellectual activity and theoretical speculations. Later in life he often advised young scientists to get a similar "shoemaker's" job and thus avoid the dangers of lopsided intellectual development.

Meanwhile, the salary which the Swiss Government paid him allowed him to have a home, and early in 1903 he married Mileva Maric, the Serbian Catholic who had been his fellow student at Zurich. The two established themselves in a simple top-floor apartment in the residential quarter, and a year later Einstein's first son, named Albert after his father, was born. Dividing his time between his family, his duties in the patent office and his scientific pursuits, Einstein was happy. A cheerful peace such as he had rarely enjoyed possessed him, and under its influence his naturally friendly nature ripened to the point where his home became the scene for the gatherings of friends who munched the chocolate for which Berne is world-renowned and discussed science and politics and economics until dawn.

Some of these friends came from the University of Zurich, where Einstein had enrolled for his Doctor of Philosophy degree. Some were acquaintances of his wife. Still others were from the patent office; the most intimate in the group was an engineer named Besso, a talented young man who had been Einstein's friend at the Academy in Zurich. It was a keen, well educated, and highly stimulating group which gathered night after night in the Einstein home and rubbed and polished their minds against each other. And there were many exciting and momentous developments that enlivened the imagination and stirred the warm-hearted and vigorous-minded group to discussion and friendly argument.



ALBERT EINSTEIN IN BOYHOOD



EINSTEIN IN BERNE IN 1905, AT THE AGE OF TWENTY-SIX,
WHEN HE FATHERED THE THEORY OF RELATIVITY

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Theodore Roosevelt was brandishing a big stick as a warning to inflated monopolists in an effort to win "a square deal" for the common man; Roentgen had discovered unsuspected rays of extreme penetrating power which he had called X-rays in token of their mysterious nature, and the Curies had provided another amazing development by finding radium; England, recovering from the twin shocks of Queen Victoria's death and the Boer War, had inaugurated the reign of Edward VII; and the new King's nephew, the ill-mannered, saber-rattling Kaiser, was making the surprising discovery of a unique destiny for "the great Teutonic race which Heaven has entrusted with the culture of the world." And perhaps more significant than any of these was the figure of a formidable-looking bearded man of thirty-five who sang the Revolutionary Funeral March in an obscure Geneva restaurant, while a countryman in far-off Russia, an unimpressive little man with a pointed beard to whom 160,000,000 humans were forced to pay homage as Czar of all the Russias, complained in his royal diary that his subjects were getting unruly and that he was obliged to teach them a lesson by ordering his guards to shoot a large delegation of them in Winter Palace Square. Some day the two men, whose interest in common was confined to that of a beard, were to exchange rôles, and the humble habitué of the Geneva restaurant was to repay the Czar's lesson by giving him a bandage for his eyes. But a greater revolution than any, one which will be an important part of the story of man and his relationship to the universe long after Lenin and the last of the Czars are forgotten, was about to take place in the simple top-floor apartment

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in Berne where the tumultuous conversation and debate of the little group of friends brought a pounding on the wall from neighbors with a desire for undisturbed sleep.

II

NEW UNIVERSES FOR OLD

That vast Expanse, of Being the Abode,
Space, which contains th' Infinity of God,
Sees in her Breast this bounded System move
Of Planets, Worlds, beneath us and above,
Whose whole Extent, so wondrous to our Sense,
Is but a Point, an Atom in th' Immense.

FROM "TRUTH" BY VOLTAIRE

WHEN Albert Einstein was a boy only eight years old, with a mind given to introspective meditation and a heart full of rebellion against the yoke of authority of his Munich school teachers, one of the most significant events in the history of science was taking place many thousands of miles away, in a country which to him was simply a pink patch in his geography book. It was the famous Michelson-Morley experiment to utilize a beam of light to measure the exact speed of our earth through space, an epoch-making test which many years later, in the hands of Einstein, became the cornerstone of a new concept of the universe which comes closer to reality than the world systems of Pythagoras, Ptolemy, Copernicus, Galileo and Newton.

Midshipman Albert A. Michelson, like Einstein, found the formal education provided for him at school irksome.

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A young man of poetic imagination and artistic breadth of conception, Michelson frequently neglected the studies arranged for those whose fond ambition it is to become an admiral in the United States Navy, and pursued his own investigations into the riddles of physics. The profound mystery of light, which gripped Einstein's imagination at the Zurich Academy, also held out a strong fascination for the young midshipman. Born in Germany, Michelson was brought to the United States at the age of four, and his father arbitrarily decided that the boy should become an officer in the navy. But genius, wrapped up in its own creative originality, has its own devious ways of overcoming obstacles; and Michelson hurdled parental and academic objections to follow his natural bent for scientific experimentation. Even as a youthful midshipman he was beginning to envision light as the luminous chrysalis of eternity, and he dreamed of the day when the solution of light's mystery would permit man to behold the preestablished harmony of our universe. But the displeased authorities at the Naval Academy had other dreams for their young charges, and when it came time for Midshipman Michelson to graduate into the ranks of Ensigns the Superintendent at Annapolis called the "temperamental" student into his office.

Not suspecting that the worried young man in the blue uniform was to win recognition within the next few years as "the high priest of light" and was to become the first American scientist to win the Nobel Prize, the Superintendent of the Academy bade Michelson farewell with this admonition:

"If you'd give less attention to those scientific things and more to your naval gunnery, there might come a time

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when you would know enough to be of some use to your country!"

The year 1879 is noteworthy to scientists for two reasons. In the first place, Einstein was born in the spring of that year in the quiet provincial town of Ulm on the banks of the blue Danube; and on the other side of the world Michelson decided to turn his back on a naval career and to devote all his energies to science. Two years later, Michelson became professor of physics at the Case School of Applied Science in Cleveland and began to perfect an invention of his, now known as the interferometer, an instrument capable of measuring minute angles to within a millionth of an inch. With this he hoped to measure the exact speed of light.

Only a fence separated the campuses of the Case School and the Western Reserve University, where Dr. Edward W. Morley was professor of chemistry. Professor Morley shared Michelson's enthusiasm for probing into the unplumbed secrets of light, and the two men soon were fast friends. And in 1887 the two professors announced that they had perfected plans for measuring the motion of the earth through the imponderable ether. This dramatic announcement set the world of science buzzing with excitement.

For more than two hundred years the problem of the mystical ether and its relationship to our earth had been an outstanding puzzle of science. To us, the earth appears stationary. We know, however, that it is gliding through space, as a fish through water. But we cannot deduce this motion from the behavior of any of the objects on our globe, any more than the passengers on a giant ocean liner making an Atlantic crossing on a quiet sea can de-

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termine the vessel's forward motion from the movements of their fellow travelers. However, we know, from our astronomical observations of the sun and the planets, that our globe is revolving around its parent sun at the speed of about 1100 miles a minute. But the sun and the solar system and the distant stars also are in motion, and since the motions of bodies are measured entirely with reference to each other, it was apparently impossible to determine the exact velocity of the earth by comparison with other revolving luminaries.

Newton, speculating on this celestial flux, this constant motion of all the matter of the universe from atoms to stars, yielded to his intellectual craving for some place of unalterable repose and pointed out that "it is possible that in the remote regions of the fixed stars, or perhaps far beyond them, there may be some body absolutely at rest; but it is impossible to know, from the positions of bodies to one another in our regions, whether any of these do keep the same position to that remote body. It follows that absolute rest cannot be determined from the position of bodies in our regions."

What then could man use as a standard of reference, as a yardstick of distance and motion? Newton found a less remote possibility than his fixed star in the inaccessible regions beyond the visible stars—an immobile and all-embracing medium that freely pervades all creation. The belief in the reality of such an all-pervading medium, or ether, took deep root in the two centuries that followed the publication of Newton's *Principia Mathematica*, and toward the close of the nineteenth century a space-filling ether had become universally accepted by physicists as the standard of absolute rest, of unalterable repose. This

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ether, extending throughout all creation to the outposts of the observable universe more than 500,000,000 light years away, was looked upon as a medium of marvelous transparency which permitted the passage of light, gravitation and all electromagnetic phenomena through vast distances with little or no absorption. The properties of this ethereal medium were truly extraordinary; it was an immaterial substance uniformly diffused through space, permeating all bodies and being contained in them; it was frictionless, since the earth is not retarded in the slightest as it moves through the heavens, as is shown by the invariable length of our days and years; it also possessed perfect elasticity and a rigidity greater than that of steel; and, finally, it was incompressible.

Unless there were an ether, light and heat could not be transmitted to us from the distant stars, physicists said. Not only would we be unable to see the distant stars, but there would be no race of human beings, since the earth would be cold and lifeless! But, thanks to this illimitable, unbroken sea of ether, light and heat radiations from Old Sol and other luminaries reach us on the backs of waves in the ether. It was no longer necessary to go to Newton's "remote regions of the fixed stars, or perhaps far beyond them," to find a world at absolute rest which would kindly act as a yardstick to determine velocities in our corner of the universe. There was the ether conveniently close at hand, eternally at rest, while the earth and the other luminaries in the cosmos galloped on their tireless journeys. Much as the air appears to rush past a speeding train or a fast-moving motor car on a concrete highway, so the ether appears to "drift" by the speeding earth "like the wind through a grove of trees." If the velocity of this

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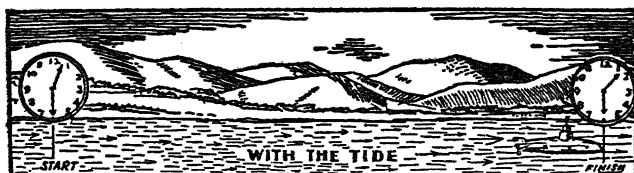
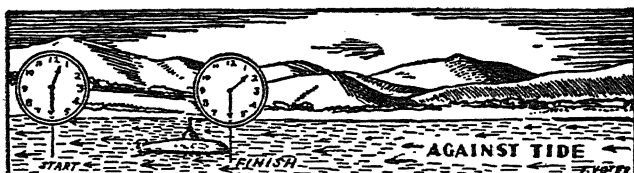
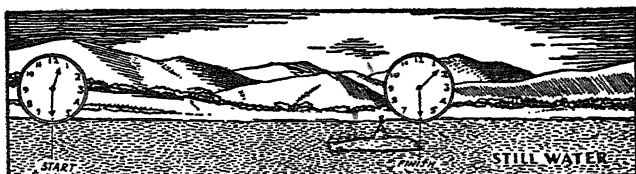
“ether current” past the earth could be measured, then the exact velocity of the earth through space would be determined.

Professor Michelson, aided by his good friend Dr. Morley, set out to do exactly that. Now, since the earth moves counterclockwise from west to east, and its polar axis, while moving in its orbit about the sun, always occupies parallel positions, the earth’s velocity is in the west-east direction. There is no motion in the north-south direction. Michelson and Morley seized upon this situation for their cosmic adventure. They set out to race two beams of light; one in a north-south direction, perpendicular to the earth’s motion, and the other in the west-east route, forward and backward in the field of our world’s movement.

An ingenious device, utilizing the supersensitive interferometer and a special arrangement of reflecting mirrors, was set up for the race between the two light rays. The whole world of science watched the race with greater eagerness than any Englishman searching for his favorite colors at Ascot. Now, if the earth were standing still in the ether, the time required for a light beam to make a double journey of a given length would always be the same, regardless of direction. But since the earth is moving in an easterly direction, an “ether drift” is created, and a light ray bucking this current is at a disadvantage in any race with a light ray unhampered by a similar handicap. Because of the motion of the earth, the first ray must in reality cover a slightly longer distance before getting back to its starting point. Therefore, a light beam which made a double journey, first from east to west and then from west to east back to its starting point, ought to take

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slightly more time than its competitor which simply made a journey of equal length in north-south and south-north directions.



RELATIVITY OF SPEED

The speed of any moving object is relative to an observer, as these three drawings illustrate. The submarine is moving forward under the maximum speed of its engines in each case, but the distance covered in one hour varies because of the motion of the water. Thus, while the ship's velocity in relation to the water remains the same in each case, its speed appears to be variable to an observer on land, who, not knowing about the tides, would assume that the submarine's engines were being run moderately fast, then very slowly, and finally with great speed.

If two motor boats were to race a quarter of a mile at an identical speed across a river boasting a strong cur-

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rent, they would both reach the opposite bank at the same moment, and, assuming an equal ability at yachtsmanship on the part of those at the helm, the two boats should be back at their starting point at the same time. But let us now change the direction of one of the boats. Let us send one of them upstream against the current for a quarter-mile and return, while the other repeats its quarter-mile journey across the stream. The craft heading upstream will have difficult going against the current and a comparatively easy time riding back, but the gain of time in coming downstream is not sufficient—as many experiments have proved—to make good the time previously lost in traveling against the current. The motor boat making the trip across the river and back should win the race easily. The difference in the time of the return of the two vessels to the starting point should disclose the speed of the river drift.

Michelson and Morley anticipated that in precisely the same way their experiment should show the speed of the earth's motion through the ether.

So, while a round-eyed, black-headed boy stood on the curb of the Ludwigstrasse, watching with mounting resentment the parades of naked bayonets and the shining boots of arrogant Prussian militarism on the march, the two American scientists began their unique race of the two light rays. The result was astonishing. They checked over their instruments and tried the experiment all over again. And still again. But no matter how often the race was run, the two rays of light left the experimenters—and scientists the world over—flabbergasted. Whether they raced with the earth's motion, or across it, or against it, they always returned at precisely the same moment! The

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race between the two beams of light never failed to end in a dead heat.

On the hypothesis that our earth was surrounded by a sea of ether, the experiments indicated that the earth's speed through it was nil. Thus Dame Nature, who had previously testified that the earth was revolving around the sun at nearly twenty miles per second, now appeared to be denying her own testimony. She was on the witness stand, and her only response to the question "What is the earth's speed through the ether?" put to her by the most experienced investigators of the day, was simply a nonchalant "None!" This astonishing response implied that the earth stood permanently at rest in the ether, while the sun and the whole of creation revolved around our puny globe! Such a result in pre-Copernican days would have been taken as a glorious triumph for the geocentric theory of the universe. But it hardly fitted into the nineteenth-century concept of the cosmos. Harassed scientists knew that the earth was moving around the sun. Dame Nature was known to be clever, but not deceitful. How then explain the strange ending of the famed Michelson-Morley test?

No scientific stone was left unturned during the following two decades to find the correct answer for that perplexing puzzle. No experiment has mystified scientists more. But all efforts to solve the mystery proved futile. Gradually scientists came to the conclusion that the Michelson experiment was "an unfortunate failure." Nature had always been regarded as a secretive lady who enjoyed her own enigmas, and there appeared to be a well-organized conspiracy by her forces to prevent mere man from penetrating too deeply into the innermost secrets

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of creation. The riddle of the motion of the human race through space apparently was one of the most jealously guarded of Nature's secrets. If the earth's movement produced a direct effect in one direction, which seemed to be an inviting clue to the earth's velocity, other forces of Nature immediately banded together to produce an opposite result, to offset the original effect. Scientists became convinced that it was beyond the power of man to smash through the barriers established athwart his path by Nature's "conspiracy." Fortunately for the human race, there was one man, toiling at the humdrum routine of a patent examiner in Berne, who did not share that conviction.

* * *

The years immediately following his marriage saw Einstein's steady march to greatness. Perhaps, after all, it was more than boyish enthusiasm which led a certain school-boy essayist to link matrimony and cosmic wisdom in this brief but pointed description of the discovery of electricity:

Benjamin Franklin was a poor boy. He went to Philadelphia to live. He didn't have many clothes. One day he walked down the street and saw a pretty girl. She smiled at him; he smiled at her. Before long they were married and he discovered electricity.

Certainly more than one philosopher has written of the rapid maturity in the human being following marriage, and one savant has dared the hazards of prophecy by placing on record his belief that "a man finds himself seven years older the day after marriage!" Be that as it may, Einstein was still only a bridegroom when his papers on

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abstruse physical studies began to appear in the *Annalen der Physik* and caused learned scientists to sit up and take notice. Married in 1903 at the age of twenty-four, a father at twenty-five, Einstein was the inventor of the famous theory of relativity at the age of only twenty-six! The two years immediately after his marriage were the most productive of his life, the harvest years of his genius.

Five scientific papers on major subjects followed each other in rapid succession, and although of these only the fifth, the one dealing with relativity, is now linked with Einstein's name in the public mind, the others in themselves were of sufficient importance to win renown among scientists. One of these papers, for example, explained a riddle that had puzzled physicists for more than eighty years.

In 1827, Robert Brown, a botanist, saw minute particles suspended in a liquid in a state of great agitation. These tiny bits of matter, barely visible under a powerful microscope, busily darted hither and yon in a mysterious fashion which remained a dark secret until Einstein turned the searchlight of his intellect upon the riddle. Einstein solved the problem by pointing out that molecular activity is increased by heat, and that the ceaseless motion of the particles was due to the bombardment to which they were submitted by the heat-stimulated molecules of the liquid. He submitted formulae and equations explaining the Brownian effect, thereby providing one of the pillars which support the atomic theory of matter. Another Einstein publication, *The Quantum Law of the Emission and Absorption of Light*, was to prove important later in the formulation of the quantum theory of light. A third paper dealt with mass and energy,

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and another, *A New Determination of Molecular Dimensions*, earned for him his degree of doctor of philosophy from the University of Zurich.

Light, motion and ether were the subjects that engrossed Einstein's mind during these years. Then, one day he came across a discussion of the Michelson test, and he was away on an orgy of speculative meditation regarding the traditional theories of the universe. His mind, set ablaze by this astounding experiment, became a melting-pot into which he poured all the time-honored ideas as to the fundamental nature and meaning of space, ether, time and motion as expounded by Newton and his followers; and out of that inferno there slowly emerged a few gold nuggets of pure knowledge which stamped Einstein as a cosmic discoverer who had pioneered a new world of thought. He had made a discovery that forced science to recast its whole picture of the natural forces which hold dominion over the destinies of the universe, and of the human race which flits about in one corner of that universe on the solidified surface of an insignificant speck of cosmic dust called the earth.

But meanwhile Einstein had to drudge away at his commonplace tasks in the patent office in order to earn a livelihood for himself and his growing family. Shortly before entering into his duties at the Berne office, he had appeared before the city fathers in Zurich for his final examination for Swiss citizenship papers. At first the judges were inclined to look askance at this young man who seemed so eager to exchange his German citizenship for that of Switzerland. They probed rigorously into his moral character, his political activities, and the health of his ancestors; but soon they became convinced that this

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strange compound of cosmic wisdom and worldly ignorance could hardly constitute a menace to Swiss institutions. With a few laughs among themselves and several jokes pointed at Einstein's mundane inexperience, they presented him with the rights of a Swiss citizen. This citizenship, which he preserved until he decided to become an American thirty years later, made Einstein feel more secure of his tenure in a government job.

Most of the patents presented at the Berne office were trivial, and provided little trouble for a man of Einstein's energy and talents. Einstein soon found that he could easily perform all the tasks assigned to him, even to the last painstaking detail required by Director Haller, by using up only three or four of the eight hours which he was expected to spend at his desk. The twenty-three-year-old youth was possessed of too active a mind to permit him to dally over the routine of his work so as to stretch it over the eight hours; besides, he was engaged on plans for an invention of his own—an invention which constituted an imaginative voyage of discovery of all creation—which kept his brain at fever heat during all his waking hours.

The good-natured, humor-loving Dr. Haller was on the whole an easygoing superior under whom to work. But he was also a strong-minded disciplinarian with a vigorous sense of moral values in some matters, and his strictest rule forbade any employee to busy himself with outside interests during office hours. The clerkly conscience which led most of Einstein's associates to observe this rule did not—could not—deter the whirling in Einstein's brain. The young scientist, who would not dream of wronging another human being, had no compunction

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in violating an arbitrary and, to him, a silly office rule. He broke it systematically, and since his laboratory has always consisted of no more than a fountain pen and a pad of paper, the violations were not difficult to cover up. On stray pieces of paper he scribbled surreptitious mathematical calculations attacking the accepted laws of the universe whenever he found time to devote to his own scientific investigations; and whenever the heavy footstep of Dr. Haller sounded in the corridor, the attacks on both cosmic and office rules came to a sudden pause. The small sheets of white paper, covered with clandestine hieroglyphics which only Einstein could translate, vanished quickly into the drawer of his desk, which he kept partly open for exactly such an emergency.

When Einstein became a father, family demands occasionally interrupted his devotions in the temple of science. But his was a worship too deep-rooted to permit of any but the briefest absence from his shrine. To other citizens of Berne, who glimpsed with friendly amusement the absent-minded air with which the young father pushed a baby carriage through the crowded streets of the Swiss capital on a Sunday, Einstein seemed to be a poet or musician who needed a little more help from the financial gods. But it was no carefully cadenced ode to a fair maiden, no mellow tune for a concert hall, which filled the abstracted father's mind as he pushed his way, unmindful of the city's jostling crowds, to one of the lofty bridges across the Aar for a look at the snake-hipped river and the gleaming Alps beyond. His powerful imagination roamed in regions which no human mind had explored before, a mysterious realm from which came the faint chanting of a heavenly choir singing a strange song. And

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when he had returned to his humble top-floor apartment, fully satisfied that he had fulfilled his fatherly duties, he dashed away to his desk to see if he could catch that celestial message and set it down in mathematical symbols.

It was an elusive chant, that of the heavenly choir. Sometimes its notes were almost indistinguishable, and Einstein, even with his overwhelming passion to know, would feel so discouraged that he would cry in despair to his friend Besso: "It's no use. I'm on the wrong track and I'm going to give it up." But that night, as he sat at his desk after a simple dinner, hope would revive in the young scholar. The heavenly choir was singing again! He was fascinated, his whole being vibrating with excitement. Feverishly he strove to catch the celestial symphony on pieces of paper until his desk was littered with them and physical exhaustion and the urgent appeals of his wife sent him wearily to bed.

Einstein's friends became accustomed to his alternating fits of melancholy and exuberant excitement. His innate modesty, however, never allowed him to go to that exaggerated extreme which led Kepler, upon his discovery of the law of planetary orbits, to exult to a friend: "Nothing holds me; I will indulge my sacred fury; I will triumph over mankind by the honest confession that I have stolen the golden vases of the Egyptians to build up a tabernacle for my God far away from the confines of Egypt. If you forgive me, I rejoice; if you are angry, I can bear it; the die is cast, the book is written, to be read either now or by posterity, I care not which; it may well wait a century for a reader, as God has waited six thousand years for an observer!" Einstein's lust for knowledge resembled more the ardent spirit of the religious worshiper or the lover,

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and it armed his spirit with the twin weapons of patience and courage with which to attack boldly the most jealously guarded citadels of Nature.

Einstein scoffed at the idea that Nature had planned a well-organized conspiracy to prevent mere man from prying too closely into her innermost secrets. To him, the famous Michelson-Morley test, instead of being the proof of such a conspiracy, was simply an expression of a law of Nature which scientists had failed to grasp. The more he pondered the problem, the more he became convinced that man had been duped by his own senses, and that a radical reorganization of our imaginative picture of the universe was needed if we were to have a truer understanding of Nature and her forces.

"Tell me, can you discern the doors, the windows and battlements of that castle?" asks Euphranor in the *Dialogues* of Berkeley.

"I cannot," answers Alciphron. "At this distance, it seems only a small round tower."

But Euphranor, who has visited the castle, assures Alciphron that in reality it is a large square building with battlements and turrets, and therefore "that the very object which you strictly and properly perceive by sight is not the thing which is several miles distant." And to emphasize his story of how the testimony of man's senses may be misleading, Euphranor goes on to say that the inference is plain that "neither the castle, the planet, nor the cloud which you see here is the real one which you suppose to exist at a distance."

Man, in his age-long search for law and order in the cosmos, ventures forth in his cosmic explorations equipped with his reason and his senses of sight, touch,

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smell, taste and hearing. But, Einstein asked himself, do these concepts and thoughts which are called up by our sense experiences give us a true and complete picture of reality? Or does the world of reality encompass something which is beyond the power of our sense experiences to reach?

In his slow evolution from a primate precursor, man has developed his mind and his senses as the weapons with which to cope with the universe about him. Man's mind, however, is a comparatively late development; most human beings are still primarily creatures of impulse, emotion and action, rather than of reason. Thus our senses may yield to notions of the universe which are irrational and yet are universally accepted as true. Some of the most religiously held concepts, such as the ancient belief that the earth is flat and is supported in space on pillars, are mere prejudices of the early childhood days of our senses.

Einstein viewed man's efforts to picture the nature of the physical universe as akin to the efforts of a fish to obtain a clear idea of what precisely is water. In either case, he argued, blind faith in the testimony of sense experiences may be misleading. We accept the color of grass as green, but is grass green at night? What happens to the green coloring when sunlight disappears? Sound is the mental interpretation of sound waves, and light is the interpretation which the brain makes of certain waves which fall upon the retina of the eye. But there are some sound waves too long or too short for the human ear to respond to them; some animals with other types of ears tuned to a different range of wave lengths hear sounds which make no impression on us at all. So it is with radia-

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tion. The human eye is a radio receiver tuned to a definitely limited range of wave lengths, and we see a very small fraction of the many known types of radiation which bombard us from all sides. Just as the imperfections of our senses, and our lack of thoughtful attention to what we imagine we see, hear or feel, may deceive us regarding the fundamental nature of colors, sounds and light, so may they mislead us in our concepts of direction, of size, of velocity, and of time and space.

An Englishman shuffling his way through a London fog, a Chinaman sitting in his houseboat on the Yellow River, an Eskimo fishing through the Arctic ice or a party of explorers at the South Pole all feel that they are standing or sitting upright. This belief is based on the undeniable testimony of their sense experiences. But would they all appear upright to an observer on Arcturus? No, said Einstein, shedding old human beliefs one by one as he trudged along the tortuous pathway to truth, they would not!

Only the Eskimo fisherman near the North Pole would appear standing upright, while the Chinaman and the Englishman would seem to be hanging miraculously sideways to our globe, and our intrepid explorers would appear on the verge of dropping off from the bottom of the earth headlong into the abyss of space. What people everywhere on earth call "down" is simply a human prejudice meaning toward the center of the earth, and what we call "up" is another illusion signifying away from that center. One man's "overhead," therefore, is the other man's "underfoot"! Both expressions have only a local significance, and to our observer on Arcturus the two "ups" indicate exactly opposite directions. Similarly, by blind adherence

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to the testimony of our eyesight, we may judge objects on earth to be large or small, fast or slow, always forgetting that a thing which is of mammoth size in comparison with other objects on earth will appear trivial to the observer on Arcturus, to whom the whole earth is nothing but an insignificant globule, or that the fastest train is pursuing a snail-like pace in comparison with the 1100-miles-a-minute speed of the earth through space.

This human tendency to judge reality in terms of our own experiences—the subjective view of truth—extends to all our concepts of the universe. Almost all of us are able to think only in pictures, pictures which are the clear or illusive mental images created for us by our senses. But even the simplest of words may have a different pictorial value to different persons. The word cotton, for example, will have a different meaning for a nurse in an operating room, for the anxious stock broker bent over the ticker tape, for the Negro hand slaving fourteen hours a day on a Southern plantation or for a pretty maiden who cannot afford silk stockings. The more complex concepts involved in such words as “where,” “when” and “why” have been the subjects of volumes of philosophy.

Einstein, transported on the wings of imagination to Arcturus, came to the conclusion that our concept of the universe is based fundamentally on the capability and limitations of human senses and imagination. Human beliefs and thoughts, according to him, “are called up by sense experiences and have a meaning only in reference to these sense experiences; but, since they are products of the spontaneous activity of our minds, they are thus in no wise logical consequences of these sense experiences.” Liberating himself from the prejudices of eyes, ears, nose, mouth,

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and fingertips, Einstein succeeded in charting a new realm of thought beyond the narrow infinitude of words and phrases. He taught that in order to establish a solid basis for our natural science, our notions of physical reality must be independent of the perceiving subject. He set himself the sublime task of creating a concept of the universe which shall be correct not for a particular observer in a particular situation, but shall be absolutely correct for all observers in all situations, whether the observer is a human being on earth, a Martian, an inhabitant of Arcturus, or a denizen of one of those pinwheel galaxies of stars hundreds of millions of light years away! But only in the prosaic terms of higher mathematics can we find complete freedom from the haphazard meaning of words in their image-creating sense and from misleading sensuous testimony; and in the language of mathematics, hard and cold and remote from humanity's daily experiences, Einstein set down his conclusions in impersonal formulae which substituted an objective for the subjective view of the universe around us and revolutionized mankind's childlike conceptions of creation.

Applying himself to the bewildering riddle of the Michelson-Morley test, Einstein boldly concluded that the world of science in accepting the results of the famous experiment as "an unfortunate failure" had failed to recognize obvious human limitations, had failed to adopt the objective viewpoint which should be the basis of all natural observation. The test, said Einstein, was in reality a brilliant success which had proved that there was no such thing as ether in the sense that Newton and science for two hundred years after him had understood it. The Newtonian ether was an unnecessary complication of the uni-

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verse, and it, together with the deep-rooted views of physics which gave birth to the ether idea, had to be thrown overboard. Michelson and Morley failed to find the velocity of the ether current simply because there is no ether, Einstein said. All the properties that cocksure physicists had been attributing to the ether were in reality properties of space, not the three-dimensional space of Euclidean geometry to which we have been accustomed since early childhood, but a space which adds to the familiar length, breadth and height a fourth dimension—the dimension of time. Moreover, added Einstein, the apparent conspiracy which seemed to bar man's efforts to determine the exact velocity of the earth was a primary law of Nature to the effect that "it is of necessity impossible to detect absolute motion in the universe by any experiment whatever." Einstein amplified this statement into a hypothetical law, pointing out that all motion is relative to the observer: "The phenomena of Nature will be the same to two observers who move with any uniform velocity whatever relative to one another." This became the basis of his theory of relativity. He was so overwhelmed by the vast implications of his discovery that he was ill for fourteen days.

With the peculiar detachment of an observer in distant space who is free from any bias in favor of traditional mundane ideas, Einstein presented his vision in thirty letter-size pages of equations. That document bore the prosaic title, "Toward the Electrodynamics of Moving Bodies," now famous simply as Einstein's Special Theory of Relativity.

On a bright June day in the year 1905, this twenty-six-year-old colossus of mathematics, who found two kinds of soap an unnecessary complication of life, but who ef-

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fecting a revolutionary reorganization of the complex fundamentals of physics, quietly walked into the office of the editor of the *Annalen der Physik* and deposited the document on the editor's desk with the courteous request that it be printed "if you can find room for it," and then walked out serenely into the warm sunshine. That paper, in the opinion of some authorities, constitutes "the greatest synthetic achievement of the human intellect up to the present time."

The great Newton, lured by the deception of sense experiences and the images they present to us, taught that all motions on earth are absolute, that the dimensions of rigid bodies are always the same, that intervals of time are identical everywhere, and that space and time are absolute concepts which are wholly independent of each other. Einstein, with the thoroughgoing radicalism of youth, attacked the fundamentals of these classic laws—proclaimed that they were fiction! They must be swept aside, he said, and replaced by new and radically different ideas. The theory of a stable earth, perhaps the most tenaciously held of all human suppositions, is nothing more than an "illusion"—another product of sense deception—said Einstein. Motion, and not motionlessness, is the "natural" state of all things. There is nothing absolutely at rest on earth or anywhere in the universe. In infinitely little things, such as the atom—and in infinitely great things, as in the largest galaxy—all is motion. Everything in the universe is moving, and everything tends to continue as it is in a restless world which is never the same for two seconds at a time; for a universe in which everything had a tendency to stop its own motion would soon become a cold and dead universe, destitute of all life and activity.

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Due to this myriad activity of Nature, there is no fixed standard for the comparison of velocities, of length, size, mass, and of time—the familiar yardstick by which we have been accustomed to measure everything in an illusory three-dimensional world. Einstein argued that everything in the physical world is relative to an observer or “body of reference,” making it impossible to measure or even to detect any but relative motions. The very nature of the interrelationship of all moving bodies makes it impossible to measure absolute velocities, size, shapes, mass, and time. There is one remarkable exception to this cosmic rule of inconstancy—only a single fixed quantity, which is unalterable and universal in nature, through the whole universe of

The illimitable Ocean, without bound,
Without dimension, where length, breadth and height,
And time and place are lost; where eldest Night
And Chaos, ancestors of Nature, hold
Eternal Anarchy, amidst the noise
Of endless wars, and by confusion stand.

The amazing exception is light. The speed of light is not relative to other velocities; it is an invariable and fixed quantity which is constant in every part of the universe. As the Michelson test so brilliantly proved, it is wholly uninfluenced by its source or the position of an observer. Nothing else in the universe is so footloose and free, so gaily wrapped in Heaven's unique gift, the majestic robes of independence. Light is the only quantity which all things can be referred to as a common basis of reference with the certainty that the measurement obtained will be objective and true on a cosmic scale, rather than subjec-

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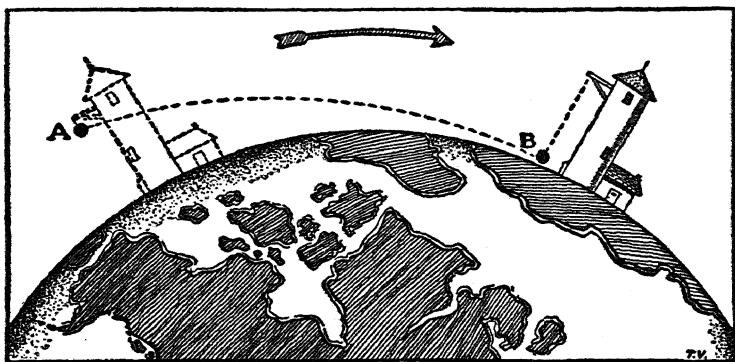
tive and true only in comparison with human values. Her Majesty, Light, is a law unto herself, a universal constant which journeys endlessly through space with the speed of 186,000 miles a second, a velocity over which no force known to man has the slightest effect! This was the great truth which Einstein emphasized.

The relativity of all motions and the concept of light as the only constant quantity in the universe are the two basic principles underlying Einstein's theory of relativity. To us, who have been accustomed since early childhood to view the earth as stable and motionless, the idea that motion, not inertia, is the natural state of the world seems, at first, difficult to understand. But, says Einstein, imagine yourself standing on a railway embankment. A train shoots by. You say to yourself: "That engineer must be in a great hurry. He is making at least 70 miles an hour." But now, continues Einstein, let us imagine another observer riding on a second train, running along at the same rate of speed and in the same direction on parallel tracks. The two trains running alongside each other at 70 miles an hour would be making that speed relative to the ground on which you are standing, but would be stationary relative to each other in the eyes of a passenger on either train. To a third observer in an airplane, flying high up amid the clouds at a speed of 140 miles an hour in the same direction as the two trains, and looking down on them, the velocity of his own machine would appear to be only one-half of what it actually is. A watcher on Arcturus would have a radically different idea of the speed of the trains and the airplane. But Arcturus is also in motion, so that the images of reality obtained by you standing on the railroad embankment, by the traveler in the train, by the ob-

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server in the airplane, and by the mythical inhabitant of Arcturus would all differ not only from each other, but, because it is impossible to separate the observed movement of an object from the movement of other bodies, they would also be different from the notions of an observer on the sun or on the distant star Hercules, toward which our sun and the whole solar system are moving.

Having swept aside our traditional concepts of motion, Einstein, his hand firmly on the pulse of Nature, now asks us to study the strange effects of motion upon our mental pictures of straight and curved lines. Let us suppose that



RELATIVITY OF DIRECTION

What appears to us as a straight line may in reality be a curve. A person dropping a stone from the top of the tower sees it fall in a straight line to earth. But he forgets that the earth is moving. Because of this motion, an observer in space would see the stone fall not in a straight line but along the curved path A...B.

our traveler in his comfortable parlor chair on the train has finished reading his paper, and being too lazy to take it to the rubbish receptacle, wraps it into a tight bundle and flings it out of the window. He watches it fall to the

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ground in what to him seems to be a straight line. But will you on the embankment see the fall in the same way? Not at all, explains Einstein. The rapid motion of the train will make the path of the wadded paper appear to you not as a straight line but as a curve. But since the earth is also in motion, the observer in Arcturus would see still another path for the dropping weight. Moreover, his observation of the highly involved curve would not agree with that of the watcher on the sun or the star Hercules. And none of them would see the earthly phenomenon as the gods, cloaked in their exclusive robes of purest objectivity, would see it!

Just as the velocities and paths of moving objects vary in relation to the position of an observer, so do our traditional measurements of length, mass and time. The standards of these units, the foot, pound and second in the English system, and the centimeter, gram and second in the metric system of weights and measures, have always been regarded as absolute and constant under all imaginable conditions. Here, again, Einstein brushes away our complacent beliefs. For with his theory of relativity constancy of magnitude disappears, and the length, mass and intervals of time as measured in terms of moving bodies all become influenced by motion to present different, and sometimes very strange, aspects.

Consider, for example, the effect of the relativity of motion on a speeding train. To make his point more striking, Einstein asks us to imagine a train 1000 feet long which is traveling with four-fifths of the velocity of light. The length of the train, as measured by a stationary observer viewing it sidewise from the railroad embankment, would be reduced to only 600 feet, says Einstein; and he presents

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an algebraic formula to prove that the gigantic speed of the train would have precisely that effect upon our vision. To a passenger, the length of the train would still be 1000 feet. The passenger and the observer on the railroad embankment would differ also in their mental pictures of the sizes and shapes of objects on the moving train. To the passenger, the dinner plates, for example, will seem circular, but to the observer outside they will seem oval. Everything in the train will seem to the observer shorter in the direction of motion than it does to the passenger by about 20 per cent.

The earth, which is traveling through space at 1100 miles a minute, loses about 2.5 inches of its diameter at the equator owing to this contraction of moving bodies for which rapid motion is responsible. If the earth were at rest, its equatorial diameter would be 7927 miles; but its movement in the west-east direction has the surprising effect of reducing its girth by nearly three inches. If a human being were to lie down in the same direction as the earth's movement, his body also would become somewhat shorter than it is in the north-south direction, although the difference would be too infinitesimal to measure. This loss of length, or compression, of all material bodies in motion increases with speed. Thus, a rod which measures one yard when at rest, will shrink to 0.999 999 999 98 yard when moving in the direction of its length at one mile a minute. If the velocity were increased to 161,000 miles per second, the length of the rod would diminish to only one-half a yard, and if its speed were raised to that of light all its material would be squeezed tight together and the rod would measure nothing! All material bodies when traveling at the speed of light will flatten into planes, according

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to Einstein. Among moving bodies, he adds, that one may be considered at rest relatively on which the same rod appears to be longer than on any other moving body.

The contraction in the length of a moving body to nothing, when traveling at the speed of light, would rob it of one of its dimensions, and would reduce it to a two-dimensional state. But in imagining a speed for a moving object to rival that of light, we are merely assuming an imaginary example for purposes of illustration. Actually, no moving object can ever, under any circumstances, quite attain the terrific speed of light. Light, which alone throughout all creation wears the regal costume of constancy, also enjoys the greatest possible velocity in the universe. And regardless of the myriad motions of the universe, resplendent light always travels with the same velocity of 186,000 miles a second in *all directions* in space. It has the ultimate and limiting velocity of the material world, a unique possession which has won it from some philosophers the reverent title of "the radiation of divine glory."

Consider some of the paradoxical situations this peculiar quality could bring about. Two cars, one traveling at the rate of 40 miles and the other at 60 miles an hour, pass each other on the highway moving in opposite directions. At the moment of passing, a flash of light spurts out from one car. How far will each of the two cars be from the flash of light at the end of a second? The answer to this cosmic riddle is extraordinary. Neither the direction nor the different velocities of the two cars will have the slightest influence on the light wave! At the end of a second, it will be precisely 186,000 miles away from each of the two speeding cars. This singular result is now an

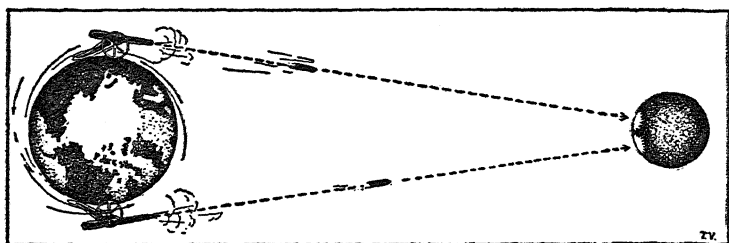
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established fact of Nature. It may be compared to the stone thrown into a still lake. The stone will cause ripples which move outward in ever-widening circles, while it remains in the center of them; likewise, light appears to travel through space in a way recalling the shape of a whirlpool, so that when a signal leaves a body it will penetrate all directions in ever-widening circles while leaving the body, no matter how it may be moving at the center of the waves. If we could ride on an airplane at the speed of 100,000 miles a second in the direction of the sun, we would find light *overtaking* us with the same momentum with which it *met* us. Night would pass from ahead and from behind us at precisely 186,000 miles a second, and our own velocity of 100,000 miles a second would not have the slightest effect in cutting down its speed relative to us!

Imagine that the earth is engaged in one of those fantastic wars with the Man in the Moon and his hardy warriors about which our imaginative novelists like to speculate. Two long-range cannon, one at the top and the other at the bottom of our globe, are aimed at the moon. The cannon are fired, and the two projectiles are away on their deadly mission at the same muzzle speed of 33 miles a minute or 1980 miles an hour. However, because of the rotation of the earth, which makes the upper side of our globe move toward the moon, one cannon shot will travel considerably faster than the other. The projectile fired in the direction of the earth's movement will gain 1100 miles an hour in speed, while the other will lose that amount of velocity from its motion. Thus, one projectile will move ahead at a velocity of 3080 miles an hour, while the other is moving along at only 880 miles

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an hour. The first shot will reach its destination about 200 hours ahead of the other. But here, explains Einstein, is the big surprise. Regardless of the different velocities of the two projectiles, the Man in the Moon, 240,000 miles away, will see the light belching from the muzzles of the two cannon at identically the same instant—one and one-third seconds after they were fired.



SPEED OF LIGHT IS CONSTANT

Two mythical cannon at opposite ends of the earth fire a projectile at the moon. Because of a difference in speed due to the motion of the earth, the two projectiles arrive at their destination days apart. But the beams of light which appeared from each cannon at the same instant arrive at the moon simultaneously, exactly one and one-third seconds after the firing of the cannon. The speed of light is not affected by any motion at its source or of the medium through which it passes, and for that reason is an important standard of measurement under the theory of relativity.

Another curious effect of relativity is the way in which it stretches and shrinks the velocity of a clock in motion. Imagine that one of the projectiles we fired at the innocent moon carried a clock on its back and that it was moving at a speed of 161,000 miles a second. To us on earth, a second measured by that imaginary clock would appear to last twice as long as a second by our clocks.

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because of the length of time required for light to carry the message of the moving clock to our vision. As a consequence of its motion, said Einstein, "the clock in translatory motion goes more slowly than at rest"! If now we place a traveler with a cigar on that projectile, it will seem to us that his cigar lasts twice as long as the cigars we on earth are smoking. Here, Einstein and his theory of relativity step in again with another breath-taking explanation. To the traveler in space, it is the cigars which *we* are smoking that last longer. Motion so affects our ideas of the passage of time that each one thinks that the cigar of the other lasts twice as long as the one he is enjoying!

If it were possible to attain a velocity greater than that of light, another amusing paradox affecting cause and effect would result. If the man on the projectile were moving at a speed greater than that of light, he would gradually overtake his past, catch up with the year of his birth, and leave it *ahead of him!* It can be proved with the aid of mathematics that if we could achieve velocities greater than that of light we should see effects before their causes operated and events before they happened. This picturesque idea has been described wittily in the following jingle:

There was a young lady named Bright
Whose speed was far faster than light;
She set out one day
In a relative way
And returned home the previous night!

This scintillation is manifestly absurd because it is impossible for any moving body in the universe to exceed,

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or even to match, the velocity of light. But it serves to bring home an entirely new conception of the relationship between man and his universe, the nature of cause and effect, and the kinship between space and time which Einstein and his theory of relativity have revealed.

The real nature of time which has emerged from this new picture of reality is one of the most remarkable features of the theory of relativity. Time had always been regarded by humankind as something absolute and independent of other forces in the universe. When the sun grows cold, and the stars are decaying with age, time, it was believed, will continue to flow smoothly on the bosom of eternity, unaffected by other cosmic events. Newton carefully defined this "image of eternity" as "absolute, true and mathematical time, which of itself, and from its own nature, flows equably without regard to anything external, and by any other name is called duration." But now that view appeared to be another of the singularly misleading conceptions of Nature which man's gullible senses had trapped him into believing.

Einstein injected the concept of motion into our age-old ideas of time, and the Newtonian hypothesis immediately began to crumble away. Not only did time lose its absolute character, but space also, which Newton likewise had defined as an absolute quantity that always remained the same "by virtue of its own nature," shed its traditional wrappings. Instead of being separate and independent entities, time and space appeared as interdependent, two aspects of a single cosmic force which itself was related to universal motion.

Man's accepted notion of time as an absolute measurement of all the events of the universe must be discarded,

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said Einstein. There is no such thing as universal time, no yardstick which enables us to arrange events in an unequivocal, chronological order so that, at any time, it might be stated objectively of two events which of them had happened first. The traditional concept of time implied that time was the same in all parts of the cosmos under all conceivable conditions, but Einstein, contradicting this facile notion, pointed out that time measurements, space, and the velocity of all the moving bodies in the universe are all so interrelated that the idea of a universal clock which was taken for granted is inherently self-contradictory. Each world, each moving body, each local system throughout the cosmos has its own local time which differs from the time of other systems according to its own motion, Einstein explained. Time, therefore, experiences changes in value just as motion does.

Einstein went on to point out that intervals of time, such as the second, are always measured by some event, or by the duration elapsing between two events, such as the extreme positions of a swinging pendulum, the revolution of an electron around the central nucleus of an atom, or the rotation of the earth on its axis or around the sun. Any of these devices may be properly styled a clock. Now see how time is influenced not only by motion but also by space! What is the measure of a period we call a day of twenty-four hours? One rotation of the earth around its axis. A year, or 365 days, is measured similarly by one complete revolution of the earth around the sun, or the amount of distance, or space, covered as the result of its continuous motion. If our globe did not move, if it did not occupy different positions in the vast thoroughfares of space, we would have no time-measure—no day,

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season, year! And since every planet has its own period of rotation, time measurements necessarily vary according to the planet on which they are made. If the earth's speed through space were to be cut by half, a year would last twice as long as it does now, and a man who reached his seventieth birthday before crossing the ultimate bridge that separates life from death would in reality have enjoyed an existence twice as long as that of an Athenian who had lived the average span of life in the Age of Pericles.

We speak of ourselves as living in the twentieth century. But what particular part of the universe are we talking about, and in relation to what other cosmic sector? The light which brings us a picture of a distant star may have left on its journey a thousand, a million or five hundred million years ago. Thus, we see the star not as it is, but as it was at the time its radiation left on its travels through space. Similarly, to our favorite observer upon Arcturus, watching the puny efforts of man for peace and prosperity through his powerful telescope, it is not the year of the great World's Fair in New York but the day of another great exhibition, the resplendent Diamond Jubilee of Queen Victoria.

"Look how tall that man is!" he is saying to his companion. "That's Captain Ames, the tallest man in all the British Army, and he is going to lead the big procession."

And the two of them look down eagerly upon the spectacular pageant of millions of Englishmen conscious of vast power on land and sea gathered to celebrate the dawn of a new era. Six miles of London streets are delirious with flags, drapery, flowers and crowded stands to honor an aged Queen who has become the symbol of imperial

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might created by enthusiastic imperialism, courage and a rare sagacity which placed the Union Jack over the greatest Empire the earth had ever seen. The roaring streets sing a significant message:

Walk wide o' the Widow at Windsor,
For 'alf o' Creation she owns,

and the implied warning is not lost upon Paris, Berlin, Rome and other capitals envious of the dominion of one people over lands stretching from sand dunes and swaying palms to evergreen pines at the edge of the frozen wilderness at the poles.

The observer upon Arcturus excitedly nudges his companion again. Still unmindful of the flow of terrestrial time since 1897, they watch as the brilliant procession gets under way. Bengal Lancers, head-hunters from Borneo, cavalry fresh from the successful conquest of the Boers and Rhodesia, princes from India, round-faced Chinamen from Hong Kong, fezged Zaptiehs from Cyprus and blue-eyed rangers from Canada and Australia gaily fall into line. And lastly, in the colorful parade so ably led by the tall Captain Ames come the smiling men who modestly confide to all the world that they are "the Lord's elect." And as they go swinging along in their gorgeous uniforms they hum the tune that is burning so many ears in the chancelleries of the Kaiser and the Czar and the slant-eyed Emperor in Japan:

He himself has said it,
And it's greatly to his credit,
That he is an Englishman!
For he might have been a Roosian,
A French, or Turk, or Proosian,

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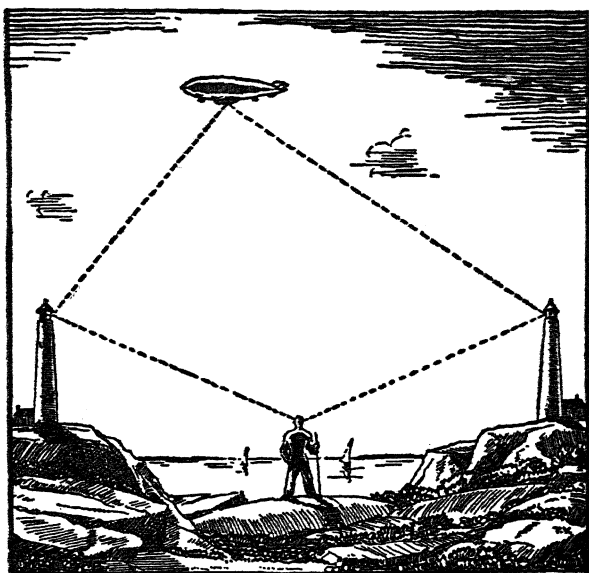
Or perhaps Itali-an!
But in spite of all temptations
To belong to other nations,
He remains an Englishman!

But now the day-long parade is over, and our observer on Arcturus and his companion retire from their telescope profoundly impressed by this display of British might and glory, and feeling a vague envy that good fortune had not made them citizens of England instead of Arcturus! The crowded story of nearly half a century since that historic procession, of tragic wars that have swept millions to their untimely graves, and of the rise of powerful dictators with the surprising effrontery to challenge the British lion's roar, must wait for another generation of Arcturus observers still unborn.

The velocity of light and the variety of clocks which measure events in different parts of the universe make all time relative. This relativity of time forces a recasting of our concept of simultaneity. As we have already seen, what constitutes the present for an observer on Arcturus represents to us the past. If a cosmic accident were to destroy Alpha Centauri today, we would not learn of the cataclysmal destruction of the star until some four years hence. Thus, the time order of events is partly dependent on the position in space of the observer. This disagreement about the relative periods of time has an important bearing on simultaneity. To various observers in different places in the universe, two events in distant places may appear simultaneous, or may appear widely separated in time, the difference of opinion depending upon the situation of the observers and their motions relative to each other and to the events witnessed.

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Our judgments of the chronological order of happenings and simultaneity on earth must also take into consideration the location of the observer and of the



RELATIVITY OF TIME

Two widely separated lighthouses flash a warning beacon at the same instant. A man on the ground, exactly halfway between the two towers, sees the two flashes simultaneously. But to an observer in the airship, moving toward the beacon at the left, the two flashes would not be simultaneous. Relative to him, the flash from the tower nearest to him would appear a fraction of a second ahead of the other, as it has less distance to cover.

relative motions of the bodies under observation. If light signals, for example, are flashed at the same instant from

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two widely separated towers, they will appear as simultaneous to a man on the ground exactly halfway between the signaling towers. But an airplane pilot flying toward one tower and away from the other will see the signal from the tower he is approaching sooner than the one from which he is moving away, and therefore will believe that it flashed ahead of the other. An observer flying in the opposite direction, however, will contradict this pilot; the light flash that appeared second to the pilot will appear first to him. Thus, three different observers may have widely different opinions about the time of the occurrence of the same event.

It is a foggy night, and the Twentieth Century, twenty minutes late on its run from Chicago to New York, is moving ahead under extra power to make up for lost time. Riding in the first car is a woman in a black ensemble reading a magazine. Another woman, garbed in blue, is reading a book in the very last car of the train, as far away as she can get from the woman in black. Although you would not guess it, they are cousins and both are on their way to the funeral of an uncle whose machinations on the Stock Exchange have netted him a fortune of five million dollars. With feminine perversity, the two women, who have had a petty quarrel, refuse to go to the funeral together.

As the train thunders over a bridge on the last lap of its journey, several passengers are startled by the screech of two windows being raised, followed immediately by two splashes in the water below. The guards are warned, the impatient engineer brings the train to a jolting stop, and a quick search reveals that the two women, overcome

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by morbid worries, have both committed suicide by jumping into the river.

But which woman committed suicide first? On the answer hinges the disposition of a large fortune. For the uncle's will specifies that each woman shall get one-half of the estate if both should survive him, but in the event of the untimely death of one the entire fortune should go to the other or her heirs. With the acquisitiveness common to many men, the playboy son of the woman in blue contends that his mother was the last to commit suicide and that he should get the entire fortune. The will of the woman in black has bequeathed her estate to charity.

The controversy at last reaches the Supreme Court. The playboy son, who is already weaving pleasant dreams of Broadway good times which his prospective fortune will make possible, watches with smiling complacency as his sharp-eyed attorney reads into the record the testimony of five passengers and a guard who say they heard the splash of the body of the woman in black first by a fraction of a second. The lawyer for the charitable institution has only one witness; a white-haired old gentleman who swears that he heard the two splashes at the identical moment. Careful measurements show that the gentleman was occupying a seat exactly halfway between the first and last cars of the train at the time of the strange suicides.

"Your Honors, it is clear that the two women died at the same time, and my client therefore should get at least one-half of the five million dollars," declares the attorney for charity, over the protests of opposing counsel.

At this point in the proceedings, one of the justices, a learned man who graduated at the top of his class in the Columbia Law School, interrupts with a few pertinent

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questions regarding the location of the old gentleman and the speed of the train. His subsequent words bring joy to the face of the attorney for charity and gloom to the playboy:

"It seems to me that all the witnesses have failed to take the train's great speed into account," says the black-robed justice. "If this old gentleman heard the two splashes simultaneously, then it must have been the woman in blue who committed suicide first. The train was moving toward one splash and away from the other—the sound of the splash of the suicide in blue had twice as much distance to cover as the other—so that if both sounds reached the ears of the old gentleman simultaneously, then the woman in blue must have died first."

And if Einstein were in the courtroom, he would be sure to give the justice's reasoning his warm approval. For another way of measuring time, says Einstein, is to measure the distance covered by anything in motion. In the imaginary trial involving the suicides, it was a question of distance, or space, traversed by sound waves. If a motorist who habitually drives at forty miles an hour sets out on a journey and drives 400 miles the first day, we know that he was on the highway for ten hours. Since time measurements are dependent on motion, and motion, in turn, cannot exist without space, Einstein concludes that the universe in which we exist must be interpreted not in terms of the traditional three dimensions but in four dimensions. In addition to length, breadth and height, space possesses a fourth quality—the dimension of time.

Since early childhood, our senses have pictured for us a world of the familiar three dimensions; of curves and

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straight lines, of cubes and parallelograms, of triangles, pyramids and circles. The ancient system of Euclid's geometry is based on the three dimensions involved in these measurements. But in describing material bodies in terms of these familiar measures, Einstein points out, we have neglected to consider motion and its copartner time. If you are giving the position of an event, as for example an explosion in an airship, it is not enough to cite longitude and latitude. The time of the event is also essential, if an exact, objective view of the happening in space is to be had. The world is moving along rapidly in space: your office in the morning will not be where it was when you left it at the close of business. It will never be in the same place in space again! Just as it is impossible for us to recall five o'clock yesterday afternoon, so it is impossible to repeat the spatial part of any event. Every happening in the universe has an existence in space—which may be described in the three dimensions of Euclidean geometry—plus an existence in time. Thus, astronomers have predicted that there will be a total eclipse of the sun visible in New York on October 26, 2144. That is another way of saying that in the next 200 years, the earth, the moon and the sun will have traveled a certain distance. To our observer in Arcturus, the date is merely a human convenience: the story of the eclipse can be told accurately simply by charting the motions of the earth, the moon and the sun through space. The positions of the three moving bodies at *any given moment* will provide the only objective description of their existence in space-time.

When we speak of space and time as separate entities, we are the victims of the prejudices and habits of thought

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which our sense deceptions have produced. Since every event that happens in the universe has both a spatial and temporal aspect, since every happening is continuous from point to point in space and from moment to moment in time, Einstein reasons that we are living in a relativity world which may be described as "the four-dimensional space-time continuum." Minkowski, one of Einstein's early teachers at the Zurich Academy, has described the new world-theory in more picturesque language: "From this day forth, space taken by itself, and time by itself, are to become mere shadows, and only a kind of union of both is to retain independence." In this space-time universe, two events are separated by what Einstein calls an "interval"—a combination of both time and space—which is the same for all observers everywhere.

The thirty pages of closely written, letter-sized paper which Einstein quietly placed on the desk of the Swiss editor of the journal of physics on June 30, 1905, contained the algebraic formulae which mathematically proved the startling new concepts of light, motion, time and space which emerged from his theory of relativity. Voyaging alone through uncharted seas of thought, with his passionate curiosity and creative intelligence as his compass, he had discovered a new world—a world where light and all material bodies appeared closely related in an everlasting flux, where time was wedded to space before the altar of eternity, and Nature revealed a view of her mysterious forces which she had granted to no other mortal.

The penetrating imagination of the twenty-six-year-old Einstein stripped from our concept of the universe

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many of the superstitions, illusions and prejudices which had burdened it since the dawn of history. The human intellect, which from the earliest days of man's search for truth has struggled to climb new mountains of understanding of the universe around us, had reached a new peak in this Olympian interpreter of Nature who was regarded as "mentally backward" in his boyhood days! Pythagoras, Copernicus, Galileo, Kepler, Newton—each achieved a milestone in the progress of the human race through the misty morning of knowledge. Einstein took the tree of knowledge fostered by these pioneers, pruned away much of the dead wood which was hindering further growth, and transplanted the whole tree in a new and specially rich field, in which to take new root and to expand in new directions toward a fuller understanding of our amazing universe.

There must have been an exultant lightness to his step as Einstein walked away from the editor's humble office to his even more humble home on the other side of Berne. At that time he had received no recognition from anyone as an intellectual luminary, and his modest soul would have been the last to think of it. But there was happiness born of accomplishment in the heart of the homeward-bound patent examiner. Fourteen days in a sick-bed, if nothing more, testified that his creative labors were out of the ordinary. And the youthful genius felt the profound satisfaction—the highest reward which the pursuit of knowledge has to offer to a human being—of standing where no other man had stood before.

III

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Before God we are all equally wise, equally foolish.

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WHEN Einstein's achievement had at last brought him world-wide fame, Lord Haldane introduced him to a distinguished London audience as "the Newton of the twentieth century, a man who has called forth a greater revolution in thought than even Copernicus, Galileo, or Newton himself." But while revolutions with thundering cannon and bloodstained bayonets catch the world's attention overnight, Einstein's rebellion against the traditional authorities of science, with its far-reaching upheaval of concepts of reality to which countless millions of humankind had blindly submitted for ages, won ground slowly.

The public remained wholly unaware of the unassuming genius who had delved into the mysterious forces of the universe and pointed the way to a new understanding of their meaning and uses; and many scientists who read of the theory of relativity considered it fantastic—they preferred to continue their scientific lives in the comfortable domicile of time-honored ideas and philosophies. Four years after the new conception of the forces

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governing our cosmos had emerged from Einstein's tortured brain through the pages of the *Annalen der Physik*, the rebel who carried a revolution under his bushy hair could still be seen leaving his unpretentious home each morning for his walk through the streets of Berne to his "shoemaker's job" in the Swiss Government Patent Office.

But great deeds need no trumpet. Sooner or later, the world will hear of them. Gradually the news spread that an astounding *coup d'état* against the ruling authorities of science had been engineered by a patient rebel in Switzerland's capital, and that many of their traditional positions regarding space, time, light and material bodies in the universe had to be abandoned before the onrushing attack of the new ideas. The great Max Planck, who himself had gained international fame in 1901 with his quantum law explaining the radiation of energy, was among the first to see in the majestic simplicity of Einstein's theory a more complete picture of the mystery of life and of our complex universe than any that mankind had ever had before. Enthusiastically he hailed the mutineer for having given science a new understanding of Nature's way of working which affected "the very root of our physical thought." The world-renowned physicist wrote to the obscure Einstein congratulating him on his courage and originality. The letter was the beginning of a warm friendship and a lively correspondence—on world questions as well as scientific problems—which continued through the years.

Another distinguished German scientist, who later was to become Einstein's colleague in Berlin, Max von Laue, saw in the theory of relativity a new Apocalypse and vis-

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ited Berne to see the author. A lasting friendship flowered from this happy visit, and when Einstein, several years later, received an invitation to join the Prussian Academy of Sciences in Berlin, the presence of Planck and von Laue in the German capital was an important factor in his decision. With two such powerful friends, Einstein began to win a substantial reputation in European scientific circles. In France the late Henri Poincaré, the foremost French mathematician, "marveled" at Einstein's power of deductive reasoning and the revolutionary concepts which that unique power had produced. From Holland, Hendrik A. Lorentz, the aging master who was a high priest of science when Einstein was still a moody boy in Munich, invited his youthful contemporary to lecture at the University of Leyden.

Einstein's growing fame finally reached his own backyard, and the authorities of the University of Zurich, Switzerland's greatest center of intellectual activity, thought it was their duty to offer the struggling patent examiner the rare honor and dignity of a professorship. To their amazement, however, he demurred! The humble position which he held in the patent office was something at which almost any ambitious professor would turn up his nose. But Einstein, who had no hankering for fame and worldly success, liked the monotonous routine of his government job. To him, it was a perfect counterpoise to his mental explorations. The unexciting routine afforded him a welcome opportunity to be practical, to earn a livelihood for himself and his family, while leaving him free to pursue his indefatigable labors in speculative science. So, with that outspoken frankness which has always been characteristic of him, he told the dum-

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founded Zurich authorities that he preferred his "shoemaker's job" to the proud dignity of a professorship. When the dignitaries got over their irritated surprise, they shook their heads vehemently. It was discreditable to the University of Zurich, which could trace its antecedents back to Charlemagne's time, that it should allow so great a creative research worker to remain in a patent office in a clerical capacity. And the dreamy, unambitious Einstein was persuaded, against his own inclinations, to join the faculty of Switzerland's foremost university.

Before Einstein could become a full-fledged professor, however, he had to serve an apprenticeship as a *privat-dozent*, or lecturer. When the timid, scholarly lecturer—now privileged to place the title of Doctor before his name—arrived for his first lecture class, a surprise awaited him. A few years later, when the magic of his name had spread, students in Berlin rioted for the privilege of hearing the savant give a lecture, but the capacity of the Zurich hall was far from taxed as he opened his academic career. There were exactly two pupils waiting to hear him! Seated together, they formed an almost microscopic oasis in the Sahara of the lecture hall. They were Einstein's good friends, Besso, who worked with him in the patent office, and Chavand, a telegrapher who wanted to become an expert on theoretical electricity. Both had been frequent callers at Einstein's hospitable apartment in Berne for those long evening sessions of mental and spiritual communion, and, understanding Einstein's fear of public appearances, they had registered for his course to give the hesitant lecturer poise and encouragement.

So Einstein lectured to his two friends about his views on the problems of heat and light, and they listened as

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intently as if these views were not already familiar to them. The smallness of his audience, however, coupled with his own lack of ambition for academic honors, lured the lecturer into lazy habits. One day, when his lecture was particularly ill-prepared and his delivery equally unfelicitous, the nervous Einstein found Professor Kleiner, his superior, among his auditors. The professor fidgeted, wrinkled his lofty brow in annoyance, and at the close of the unhappy period walked up to Einstein to lecture the lecturer. But instead of the excuses and the pleas for indulgence which he expected from the youthful newcomer to the university, Professor Kleiner received the undaunted Einstein's offer to resign and to pursue the duties of the Berne patent office. Moreover, Einstein suggested, there was another young man, his friend Friedrich Adler, who was more capable than he to undertake professorial duties. Why didn't Kleiner offer the position to Adler? Einstein's former classmate was an excellent teacher who enjoyed the friendship of the director of public education at Zurich, and who, like himself, was an ardent Socialist, so that his chances of obtaining a professorship were unusually good; but when the idealistic, unselfish Adler heard that his own candidacy might hurt Einstein's opportunity he immediately renounced his own ambitions and, without mentioning his sacrifice to anyone, retired into the background. Einstein, having completed his apprenticeship as a lecturer, became a professor in 1909, and for the second time in his life established his home among the 200,000 German-speaking Swiss in the cosmopolitan, friendly city of Zurich.

Dr. Einstein was not yet quite thirty when he found himself once again beside the beautiful, elongated lake

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which stretched for twenty-five miles at the foot of the jagged Alps, and walked with newly acquired honors by the magnificent public buildings and stately private villas of the city where he had gone to school as an obscure emigré from Munich. He liked the city, which contained many of his best friends and most of his pleasant boyhood memories, almost as much as he disliked the onerous duties of a lecturing professor. He obtained for his family a simple apartment in the same building in which his friend Adler lived—in an unpretentious section of Zurich—and on Sundays assumed new paternal duties by wheeling out a newcomer to the Einstein household—a second son, Eduard.

The thought that his promotion to the elevated position of a professorship might bring a change in his mode of life never entered the mind of Einstein. Free of selfish desires, he was strongly drawn to the simple life and regarded as contrary to justice all class distinctions based on wealth. To the accompaniment of Adler's enthusiastic approval, Einstein proclaimed that the unequal distribution of wealth was a "sad injustice" and in the last resort was based on force. He declared that plain living was good for everybody, both physically and mentally, and to those who remonstrated that, with careful application to his academic duties, he would enjoy a bright future, the youthful professor replied with some heat:

"He is happiest who wants least from anyone. I do not care for money, decorations or titles. I do not crave praise. The thing I value above all else is the understanding and the appreciation of my fellow workers."

To Einstein, the ordinary objects of human endeavor, property, outward success, luxury — the riches of the

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moneyed man — always seemed “contemptible.” An empty purse held no fears for the young teacher, for his worldly wants were so few that outside of the articles necessary for bare subsistence there was almost nothing the lack of which could make him feel poor and discontented. In spite of the meagerness of the salary paid to a beginning professor at the University of Zurich, Einstein regarded himself as richer than his more opulent colleagues, for he was content with the least amount of worldly possessions. He frankly avowed as much to a physicist who had made a special visit to Switzerland to see Einstein and to dine with him. Over the coffee cups, the visiting savant pointed out that while all learned men craved academic honors it is the young who should find particular happiness in the possession of such tributes. He congratulated Einstein on his “admirable achievements” and sighed:

“Most of us scholars are appointed to academies when we are too old to care about it any longer.”

“Really,” replied young Einstein dryly, “if these people are appointed when they no longer care about the honor, I may as well be proposed right now.”

This lack of desire for glamorous academic honors, the absence of any pride in his Zurich professorship and his contempt of mammon, whom many of his colleagues were inclined to worship in company with the vast majority of humankind, hardly endeared Einstein to the other professors. The appearance of the young, black-headed teacher, who only yesterday was an underling in the patent office, in the midst of the graybeards who had won their professorial rank only after many years of hard work in classrooms and the exercise of considerable influ-

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ence, had already inspired envy and fear in many. They were as proud as peacocks of their professional robes, and while some of them were conscientious and hard-working teachers, the majority valued their position chiefly for the worldly privileges it bestowed upon them in the social life of Zurich. In this faculty-club and country-club atmosphere, the rebellious Einstein's defiance of the traditional pursuits of fame and worldly success aroused open animosity. They felt that it was all right for him to believe in the simple life and plain living, and to practise it for himself if he chose; but when the dreamy newcomer declared in public that ease and comfort were "the ideals of inferior beings" and contended that it was the duty of scientists and teachers "to exist for our fellow men," they began in increasing numbers to give him the cold shoulder.

This clash of personality was intensified when it became apparent that the Einstein who believed that money merely bred selfishness was equally unorthodox in his scientific views and methods of work. With few exceptions, the scientists of the period were empiricists—men who based their convictions on observed experiences and regarded laboratory experiments as the foundation of all true science. In keeping with this traditional attitude, many of the Zurich men of science shunned all contact with the deductive and theoretical principles of research. To Einstein, who believed that the supreme task of a physicist was to arrive at universal elementary laws from which the cosmos could be built up by pure deduction, it seemed that many of his colleagues welcomed the deep slumber of decided opinions and the relentless embrace of prejudiced concepts.

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Einstein vainly argued that there was no logical path to the discovery of the fundamental laws which govern Nature's ways of working—that only intuition, resting on sympathetic understanding of experience, plus imaginative voyages of discovery using the deductive principle as a compass could lead them. He boldly contended that imagination was more important than knowledge; that imagination was a quality that made human beings “like gods” and enabled us “to talk to the stars.” But even Adler, who saw eye to eye with Einstein on most scientific problems, defended the empirical-critical philosophy of Ernest Mach and opposed his friend's adherence to the philosophy of deduction, of the efficacy of inventive thought, expressed in mathematical symbols, to expand the horizons of knowledge.

But Einstein could call on the support of history for his position that the great adventure of man's conquest over his own ignorance must rest on artistic intuition and truths demonstrated by the deductive reasoning of great minds. For, while our knowledge advances by the discovery of new facts, the outstanding landmarks in the progress of science have come from the discovery of natural laws by theoretical explorations of the mind. Such laws have created new concepts which not only have accounted for the facts already known but have made it possible to infer new facts. Copernicus, for example, when he overthrew Ptolemy's cumbersome system of epicycles with his simpler and more logical system of astronomy, not only provided a thoroughly satisfactory explanation of the already known motions of the planets but also gave mankind a new tool with which to probe into the mysteries of the heavens. When Newton pointed to

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the force of gravitation as an explanation for the elliptic orbits of the planets and the earth's pull on terrestrial bodies, his discovery was another triumph of the deductive principle. So was Darwin's law of natural selection, which explained the extinction and survival of certain species in terms of "survival of the fittest." All three, like super Sherlock Holmeses, collected facts that seemed quite strange, incoherent and wholly unrelated, and by pure thinking used these facts as clues to formulate a sweeping explanation that correlated the facts and swept away their mystery. The spark of divine genius, which had impelled Copernicus, Newton and Darwin to become epoch-making detectives in the search for the causes underlying the facts that science had accumulated, had also struck flame in the lonely, master mind of Einstein.

But the meditative young professor was no Dempsey of the intellectual arena. Never a natural fighter, his defiance of the conventional atmosphere of the Zurich faculty rarely flared into open rebellion. His solitude-loving nature hated all forms of public contention. To him it seemed that the selfish, success-worshipping antics of most of his colleagues, and their blind adherence to blind empiricism and the mere accumulation of knowledge, conspired to stand sentinel over their minds and hearts to keep them vacant of what was most worthwhile. But he was content to laugh in his sleeve at them. He remained steadfast to his own aims, to his own joyful anticipation of creative work, confident that in the end the ideals of truth, goodness and beauty, to which his life had been an obeisance, would prevail.

His experiences at Zurich, and in the succeeding university posts he was destined to fill, deepened his con-

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viction that the temple of knowledge contained many persons who considered science as "their own special sport to which they looked for vivid experience and the satisfaction of ambition." Many of the devotees of the temple offered the products of their brains on the altar of knowledge for purely utilitarian purposes, he pointed out, and if an angel were to descend from Heaven and drive out all such people, the temple would be "noticeably emptier." The expelled academicians would be equally happy as tradesmen, officers, or workers in any other profitable human activity. But the visiting angel would find a few worshipers in the temple to whom we owe its existence—rather odd, uncommunicative, solitary fellows, actuated by the spirit of the painter, the poet, the speculative philosopher and the natural scientist, who searched for the preestablished harmony of our mysterious universe with the passionate spirit of the religious worshiper or the lover. Einstein pointed to his friend Max Planck as a scientist who lived up to this picture of the ideal devotee at the altar of knowledge. Years later, the world was to take this tribute to Planck and fashion it into a resplendent crown for the brow of its author as the most distinguished worshiper to enter the temple during the twentieth century.

To Einstein, solitude was as welcome as a bride is to her groom. His impassioned hunger for quiet investigation, coupled with his dislike for many of his professorial colleagues, often filled him with a yearning for the peace and simple life of Berne with its freedom for mental vagabondage. But his growing reputation put the contemplative existence for which he longed further out of his reach. Urgent invitations to address scientific conclaves came to

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him from all parts of Europe—invitations not from pretentious pedants but from the great masters and leaders of science whose names commanded respect the world over. Since these invitations carried with them a tacit recognition of his work, and brought him into contact with men whose learning might prove valuable in relation to his own investigations in developing the theory of relativity further, Einstein felt impelled to accept them. The first forum of scientists to hear him convened at Salzburg, whose picturesque setting in the Alpine foreland, extensive salt mines, and seventeenth-century Renaissance cathedral on the model of St. Peter's in Rome have made it a perennial Mecca for tourists. The lecture was a success, and the scholarly audience rewarded him with genuine applause. Soon he was aboard a train again, headed this time for Holland. Lorentz, whom he had corresponded with, but never met, had asked him to address the University of Leyden. Einstein had always had a deep respect for Holland's master physicist, and the meeting of the aging scientist and the youthful professor from Zurich was an exciting event for both. Einstein was profoundly affected by Lorentz's charming personality, his kindly disposition, his creative originality as a scientist, and his advanced views regarding the need of international cooperation by men of intellect for the world's good. And the impression left by Einstein's personal qualities and by the power and courage of his ideas must have been equally favorable, for soon after his return to Zurich he received an invitation to join the faculty of the University of Leyden.

Einstein was strongly tempted to accept the invitation. The University of Leyden is one of the oldest and most

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famous centers of learning in Europe. It was founded in 1575 by William of Orange as a reward to the ancient town in which it is located for its heroic defense against the six months' siege of the Spaniards in 1574. The defenders, who had relieved the siege by cutting the dikes, welcomed the gift with open arms. The university gained in fame through the years, and by 1911, when Einstein was invited to join its family of scholars, it had become the center about which the whole town of Leyden revolved.

Almost simultaneously with Leyden's offer, however, there reached Einstein an urgent call from the universities at Utrecht and Prague. The invitation from Prague held out the position of Professor Ordinarius of Physics, the highest academic rank, and a salary substantially greater than any he had ever before received. For Einstein, with his monkish asceticism and his complete lack of ambition for fame, the personal advantages inherent in the Prague offer carried little weight, particularly so as he regarded himself as a Swiss citizen and the thought of settling in what was then an Austrian city was not a pleasant one. However, his growing family—there were two sons as well as a wife dependent on him for support now—had increased his financial burdens. Moreover, he was in the throes of a new struggle with the mysteries of the universe, and he yearned for a situation that would permit more freedom for creative adventuring of the mind than he could find at Zurich. These two considerations influenced him, in spite of a certain amount of fear and misgiving, to accept the call from Prague.

Einstein had completed three semesters of teaching at the University of Zurich when, shortly before Easter in

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1911, he changed from the stately splendor of modern Switzerland to the provincial city in northern Austria which was a medley of medievalism and modernism. Situated on both banks of the Ultava, on a site continuously inhabited since paleolithic times, Prague possessed national and cultural traditions as ancient as its cathedrals and palaces and crooked streets. In the city itself was a strong, centralized movement, daily growing stronger, which was working to revive Czech nationality and to win independence. In the outlying areas were fertile hills and picturesque little valleys, with pleasant homes and gardens spreading along terraced slopes. This romantic combination of ancient history and the newer beauties of a modern age fascinated Einstein's artistic soul, while the pleasantly mild climate of the city, sheltered as it was between surrounding heights, was a boon to his health. He also found his associates on the faculty helpful and companionable, and since the university at Prague was considerably smaller than the University of Zurich, he discovered that it was possible for him to enjoy closer contact with the students who attended his lectures.

In this congenial atmosphere, the misgivings which had accompanied Einstein to Prague quickly vanished, and the youthful professor settled down with his family to a peaceful existence. Although his wife occasionally remonstrated with him, he could not be induced to take advantage of his increased income to indulge in a more elaborate mode of life. He looked upon social associations as superfluous and superficial. He craved only seclusion and leisure for his scientific work; and whenever he could escape from his domestic and university duties, he took long solitary walks, better to become acquainted with the

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thoughts burning within him. His feet took him through the Jewish cemetery, where yellowed gravestones told a thousand years of history; to the "Old Town" quarter, where the Tyn Church, memorable for its tomb of Tycho Brahe, faced a fourteenth-century town hall; to the near-by woods and tree-covered hills; but his mind was rarely with his body. For a new vision had taken hold of him. The thirty-one-year-old professor, who impressed his colleagues at the University of Prague as a likable young man who at times was distinctly unsociable, had entered into a long period of self-communing which was to unlock a few more pages from the sealed book of Nature after years of travail.

To anyone without Einstein's power of joyous renunciation and his passionate belief in the accessibility of the secrets of Nature, the task he had set for himself would have seemed impossible. Even before the *Special Theory of Relativity* had appeared in cold print in 1905, he had begun to extend the relativity theory to include gravitation and to formulate in human terms the basic principles that govern the universe in which we live. Working with algebraic figures, which alone, in his opinion, guarantee "the highest purity, clarity and certainty," this champion juggler of mathematical formulae set out to prove that gravitation is another aspect of space and time. Ten years later, in 1915, when Europe was in the grip of the World War, his labors were crowned with the *General Theory of Relativity*.

The decade from 1905 to 1915, however, was fruitful of other notable achievements in the world of science. In 1910, for example, Einstein again demonstrated his power as an imaginative thinker by solving the so-called mercury

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anomaly which for many years had troubled scientists, particularly France's great Poincaré. The brilliant French mathematician, who with Mme. Curie had recommended Einstein to the authorities of the University of Zurich in 1905, called the young professor one of the most original thinkers of the age.

"What we marvel at in him, above all, is the ease with which he adjusts himself to new conceptions and draws all possible deductions from them," said Poincaré in his public tribute. "He does not cling tightly to classical principles, but sees all conceivable possibilities when he is confronted with a physical problem. In his mind, this becomes transformed into an anticipation of the new phenomenon that may some day be verified in actual experience."

A year later, in 1911, shortly after his arrival in Prague, Einstein announced the discovery of what was to become the cornerstone of his *General Theory of Relativity*. This was the principle of the equivalence of inertia and gravitation, and its discovery marked the first step toward the supreme generalization which was to come four years later. It was while he was at Prague that the giant mentality of Einstein began to fashion a searchlight which was to pierce through the enshrouding fog of his hopes and ideas and lead him to his ultimate triumph.

His mental progress was along a difficult road, unlike the fertile valleys about Prague through which he loved to roam on his solitary walks. His meditative highway was full of ruts and rocks, of misleading forks, of false turns which frequently led him into a dead-end street in the labyrinth of Nature. One of these wrong turns, Einstein later admitted, cost him "two years of excessively hard

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work," and he was forced ruefully to retrace his steps to previously discarded positions. Strong confidence and intense despair alternated in his troubled mind, but his conviction that the harmony of Nature can be expressed in simple mathematical laws renewed his faith in the ultimate triumph of his search for truth. "I think and think, for months, for years," he confided to a friend. "Ninety-nine times the conclusion is false. The hundredth time I am right."

Unflinching before the gigantic task ahead of him, Einstein pursued his goal with the same lofty passion which endows the creative artist, and with that intuitive inspiration which Newton felt when he wrote in 1676 about a geometrical theorem: "It is plain to me by the fountain I draw it from, though I will not undertake to prove it to others." Einstein himself once described his urge for creative meditation as "curiosity and demoniacal possession." With that profound "demoniacal" devotion which knew no discouragement at the novelty or difficulty of his ideas, he steadily moved toward the solution which his imagination had envisioned long before mathematical processes had provided the foundations for it. Einstein believed that Nature is the realization of the simplest conceivable mathematical ideas, and he was convinced that man can discover by means of purely mathematical constructions the concepts and the laws which furnish the key to natural phenomena. He declared that the creative principle resides in mathematics, and "in a certain sense, therefore, I hold it true that pure thought can grasp reality, as the ancients dreamed."

With pen and paper, the only compasses he has ever used for his exploratory journeys into the unknown, Ein-

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stein sought, therefore, to lead science to the destination which he already had seen with his mind's eye. But the happy achievement of his objective was preceded, in his own words, by "years of anxious searching in the dark, with their intense longing, their alternations of confidence and exhaustion, and the final emergence into the light—only those who have experienced it can understand that!"

During a period of great mental strife, he forgot all about his home and professorial duties and disappeared completely. Two days later he returned with a hungry, haggard mien, and with clothes which advertised that their pudgy wearer had been sleeping in them in a thicket. Music and tramping were the only relaxations he allowed himself; and these were hardly relaxations, since they seemed to encourage his mind to soar to the far-off stars. He read little. New books intended for pleasant reading in a summer hammock or beside a winter fireside never appealed to him. Occasionally he dipped into Goethe and Shakespeare, whom he has always admired, and for amusement he perused Voltaire. He liked, too, the intellectual companionship of Schopenhauer, Locke, Hume and Nietzsche; and less frequently of Homer, Zola, and Ibsen. Dostoyevsky's *Brothers Karamazof* and Cervantes' *Don Quixote* will endure as long as the stars, he would add, if anyone persisted in probing into his literary tastes.

As Einstein grew older, he read less and less: as his creative labors occupied more and more of his time, he turned less frequently to books. He told a friend that he preferred thinking to reading, for after a certain age reading diverts the mind from its creative pursuits. He pointed out that "any man who reads too much and uses

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his own brain too little falls into lazy habits of thinking, just as the man who spends too much time in the theaters is apt to be content with living vicariously instead of living his own life."

During the year and a half that he spent at Prague, Einstein, successful leader of a one-man rebellion, witnessed close at hand another type of revolutionary—the Czech rebels. Intensely patriotic, these mutineers against German dominance were determined to unite the diversity of races, languages and religions of their country into an independent Czech nation. Under the Hapsburgs, Czech national life and language were almost destroyed, but a national revival of Czech culture had begun during the eighteenth century, and by 1912 its diverse manifestations made the air electric in the beautiful city of Prague and its picturesque environs.

Even Professor Einstein, deeply engrossed as he was in his own intellectual battles, could not fail to sense the ill-concealed political conflict in which Prague was absorbed. The age-old quarrel between the Czech nationalists on the one hand and the Austrians and Germans who had taken over their country on the other had reached a dangerous stage. As Einstein walked through the crooked, medieval streets, crowded with Prague's 600,000 inhabitants, he felt sure that many of those who gave him a cheery greeting were carrying a political revolution in their hearts and upon their lips. The faculty meetings at the university frequently became transformed into hot-headed wrangles in which noisy politics completely effaced pedagogy. For the benefit of the solitude-loving newcomer from Zurich, who looked on at the angry disputes with a mildly quizzical air, the patriotic professors

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pointed out that the Czech nation had been wrongfully deprived of its independence as a result of the Thirty Years' War, that the Czechs had never given up the idea of recovering it and felt that now was the opportune moment for the bold *coup d'état* to achieve their purpose. They buttonholed the bewildered Einstein, who was eager to retire to his mathematical hieroglyphics, and described to him in impassioned tones the glories of Bohemia, for centuries one of the most powerful states in Europe; and when they succeeded in overruling the gentle remonstrances of the guileless visitor with a Swiss citizenship card in his pocket, they dragged him to the "Old Town" quarter to see the Tyn Church, once the religious center of the Hussite movement which influenced all Europe, to the vast fortified palace in Prague of the ancient kings of Bohemia (later to become the headquarters of the Czechoslovak Government), and to their homes where melancholy folk songs and dances in colorful native costumes captivated Einstein's love of the beautiful.

Being an intensely human man when his mind was not lost in cosmic exploration, Einstein could not help feeling considerable sympathy for his Czech friends. He hated oppression of any kind with all his heart. The state, he said, should be the servant of its people, not its master, and should be so fashioned as to provide the greatest amount of protection, peace and security for the individual, so that he might develop into a free and creative personality. He felt that the road to peace for a nation—and to happiness for the individual—rested largely upon the attainment of this ideal, and when the Czechs sought it for themselves he sympathized with their ambitions.

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Meanwhile, dark clouds were lowering on the horizons of Europe, and Einstein saw in the increasing war spirit proof that nationalism, when "monstrously exaggerated under the fair-sounding but misused name of patriotism," may become an exceedingly pernicious power. The fate of the human race was dependent on its moral strength, he argued, and the way to a joyful and happy state could be found only through renunciation and self-limitation everywhere. Unrestrained nationalism, with its attendant national and cultural egotism and its demands for compulsory military service, would, he feared, cause another disastrous display of that brute force which he considered unworthy of modern civilization. And as the ill-advised diplomacy of the strutting Kaiser forced England, France and Russia into a closer alliance and made of the whole of Europe a watchful armed camp, Einstein wrote to a friend:

"O that the nations might see, before it is too late, how much of their self-determination they have to sacrifice in order to avoid the struggle of all against all!"

But the sound of fifes and drums grew louder. The spectacular and eccentric mustache on the Kaiser's upper lip achieved new heights of arrogance. And Austria, with equal imbecility, seized Bosnia and Herzegovina in violation of her treaties. Europe became a row of pent-up volcanoes, and as the upheaval came closer and closer, the tension in Prague and in Einstein's peace-loving soul grew deeper and deeper. As the insatiable appetite of bloated German nationalism drove Europe into a race of armaments, Einstein warned all who would listen that the piling-up of weapons of destruction was a serious temptation to war, that as long as large armies and navies existed,

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any serious quarrel was likely to embroil nations in bloody hostilities.

The strong dislike of militarism which had taken root in him when as a boy of eight he had watched the parades of German might through the streets of Munich had grown into a passionate hatred. He viewed the military system as a display of national vanity, as "the worst out-crop of the herd nature," and remarked that a man who can take pleasure in marching in fours to the strains of a band should be despised, for such a person "has only been given his big brain by mistake; a backbone was all he needed." Einstein was no less bitter in his denunciation of those women who supported the "degrading yoke of militarism" and under the guise of patriotism were ready to drive young men into the bloody arms of Mars. These patriotic women, he said, ought to be sent to the front when war came instead of the men, for "why should not such heroic feelings on the part of the fair sex find a more picturesque outlet than in attacks on defenseless civilians?" His enmity for war grew ever more intense with the rising tide of the war fever, until it engulfed his whole being. With an unrestrained hatred which normally would have been alien to this gentle, childlike genius, whose beacon through life was truth, goodness and beauty, he cried out:

"Heroism by order, senseless violence and all the pestilent nonsense that goes by the name of patriotism—how I hate them! War seems to me a mean, contemptible thing. I would rather be hacked in pieces than take part in such an abominable business."

But the armed hosts throughout Europe were sharpening their naked steel, and the thing he abhorred drew

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nearer daily. It was in vain that he, in company with a handful of other pacifists, warned of the horrors of war, and pointed out that armed conflict was a sign of a decadent civilization. The warnings fell on the barren soil of international hatred. Einstein's gospel of reconciliation, of the joy in life and love toward all living creatures, found few sympathetic ears in a Europe whose heart was burdened with hate and the war spirit. The world-wide fame which now was only a few years ahead of him had not yet arrived to place a pulpit under his feet and a microphone before his voice that would make it heard in every corner of the globe. His bitter denunciations of war were heard by a comparatively few—faculty colleagues, friends and associates like Lorentz in Holland, Planck in Berlin and Sigmund Freud in Vienna with whom he corresponded. And it was the greatest tragedy in the life of this very human man—who believed that there never was a bad peace and that there never was and never could be a good war—to be forced in the autumn of life to modify his lifelong pacificism to the extent of advocating war to preserve the world against the religious persecution unleashed by a new egomaniac in Berlin. When he and thousands of other victims were exiled from their native lands at the command of a German tyrant who, like the Kaiser, was fond of an eccentric pattern in the hair upon his upper lip, Einstein suggested that a special dispensation might be granted, absolving conscientious objectors from their vows and authorizing them to bear arms against Hitler. He argued that Hitlerism menaced the peace of the world and reiterated the familiar slogan that we must preserve peace even if we have to fight for it—an argument which dumfounded many of his pacifist

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friends and caused such orthodox leaders as Henri Barbusse to read him out of the pacifist party.

Entry into the temple of fame is the most difficult achievement of humankind, a fact which has led a philosopher to observe that men's fame is like their hair, "which grows after they are dead and with just as little use to them!" But the goddess who reigns in fame's temple, and whose favor is sought vainly by so many eager men, will, on very rare occasions, desert the rôle of the courted and go courting herself. It was the lot of the modest Einstein, who aspired to neither fame nor fortune, to receive this unique honor and to become at a comparatively early age the witness of his own immortality.

His reputation for great achievement, which had been known to only a few associates during his stay at the University of Zurich, spread throughout the whole world of science in the years immediately preceding the outbreak of the World War. The temple of fame had its doors wide open to him, and, while he had come to love Prague and hated to leave it, his growing reputation constrained him to utilize his talents on a larger stage.

In the fall of 1912, after having lived for nearly two years in the beautiful Czech city, he regretfully bade farewell to his friends and returned to Zurich. It was the third time he had settled down in the thriving Swiss metropolis, but this time his sojourn was destined to be brief. His new post was at the Confederate Polytechnic Academy, where, as a fugitive from the militaristic routine of the Munich gymnasium, he had come to study in 1896. Now he returned as a colleague and peer of Switzerland's foremost scientists to the proud institution where, as a shy foreign boy, poor, ill-clothed and badly fed, he had first

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nourished his consuming passion for intellectual investigation sixteen years earlier. Einstein's name was now so well known that even the students shared the admiration which the faculty lavished upon him. In contrast to the time when two friends had made up the whole audience at his first lecture in the neighboring university, Einstein's courses were the most popular with the student body at the Academy.

In spite of his many official duties, which were somewhat more exacting than they had been at the University of Prague, Einstein pushed his mathematical investigations into the mysteries of gravitation. His powerful intellect had succeeded in crossing several crests of the mountain range that divided the known from the unknown during his studies at Prague. He had overcome the immature and inadequate concepts which must precede the attainment of any final objective in the sweeping intellectual revolution he was seeking. The outlines of his new hypothesis, which was to go even beyond the special theory of relativity in daring and scope, were now clearly visible; but it was still necessary to complete the painstaking details which would serve as the beams and walls of the supreme structure. This demanded a long and difficult intellectual struggle, which frequently necessitated tedious hours of juggling of mathematical hieroglyphics—a labor that taxed the courage and perseverance even of Einstein with his “demoniac possession” to push ahead.

During this arduous period of progress and retrogression, he was fortunate in having the friendship, encouragement and collaboration of his old friend, Marcel Grossmann. Grossmann was adept at figures, just as in his

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school days he had been highly proficient in keeping neat and thorough records of lectures. And just as those lecture notes had helped the student Einstein to cut classes and indulge in imaginative explorations on solitary tramps, so now Grossmann shouldered much of the tedious routine of Einstein's mathematical calculations so that the scientist could have more time for musing and probing into the farthest reaches of the empire of the human mind.

At times the ultimate goal seemed close at hand, and Einstein would be glowing with enthusiasm and confidence; but a few days later he would see himself as the victim of self-deception and disillusionment, and victory would suddenly slip from his grasp. This continuous alternation of enthusiasm and disappointment increased his reluctance to give up part of his time to teaching. His dreamy, contemplative nature craved uninterrupted solitude and leisure for thinking. After five years of professorial duties, he still had not, in the spring of 1914, overcome the timidity which characterized his public appearances. He described his lectures as "performances on the trapeze" and retired with relief to the stark quiet of his own study. But early in 1914 there came to him the opportunity to shed the oppressive cloak of lecturing and devote all his time and energies to his own imaginative voyages of discovery.

Promenaders in the shade of the lime trees along Berlin's mile-long Unter den Linden like to stop to study the famous pediment group known as "Art and Technical Science Rendering Homage to Athena," which adorns the sandstone façade of the vast Prussian State Library. Opposite the monument of Frederick the Great and adjoin-

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ing the University of Berlin, this great structure, built at a cost of 25,000,000 marks, is the pride of Berlin's 4,000,000 inhabitants, who see in it visible proof of their own great industry and attainments. There are many beautiful and impressive statues, monuments and public buildings along Unter den Linden, from the Royal Palace at one end to the Brandenburger Tor at the other, but none more majestic in its spaciousness and more beloved by Berlin for its historical and intellectual associations than the Prussian State Library.

This impressive building is the headquarters of the oldest and most renowned scientific institution in Germany—the Prussian Academy of Sciences. Founded by the great Leibnitz in 1700, under the benevolent protection of King Frederick the First of Prussia, the Academy has numbered among its members the greatest scholars of Germany. Organized into four sections, devoted to physical, mathematical, historical and philosophical investigations, the Academy limited its membership to 70 full members and 200 corresponding members. For the most part, the regular members were also professors of the University of Berlin, but the Academy primarily concerned itself with original investigation rather than teaching. To further this object, the Academy in exceptional cases bestowed a professorship upon a famous scholar to enable him to devote his entire time to scientific work. Max Planck had been endeavoring for several years to get one of these professorships for his friend Einstein, and in 1914, after the physicist Van t'Hoff, the holder of one of these posts, died, he succeeded.

During the Easter festivities of 1914, Einstein caught his first sight of the famous Spree, on both banks of which

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spread the greatest industrial and commercial city on the continent of Europe. He arrived in Berlin with no fixed pedagogical duties. His secret desire to find peace and solitude for his original investigations, unburdened by the official duties of a professor, was about to be fulfilled. He had the privilege of lecturing at the near-by University of Berlin when he wished, but did not have to exercise that privilege. Together with his professorship in the Prussian Academy of Sciences, he received the post of director of the Kaiser Wilhelm Institute for Theoretical Physics, a unique organization founded in 1911 by the Kaiser, on the occasion of the hundredth anniversary of the University of Berlin, for the sole purpose of scientific research.

Einstein was only thirty-four years old, a bold rebel who had overturned concepts in physics "sacred" to many men with whom he was now to associate, when he thus triumphantly captured the most jealously guarded citadels of German scholarship. In view of his youth, this was the greatest tribute that the Prussian Academy had ever paid to any scientist. Happy in his new-found independence, he settled down with renewed hope and vigor to complete his relativity investigations, never dreaming that nineteen years later he would have to flee from this hospitable center of learning with a price on his head.

It was, therefore, with a heart full of happiness and gratitude that he rose to greet the group of gray-bearded scholars with his inaugural address as a member of the Academy. For most members it was their first glimpse of the man who, they remarked, looked more like a dreamy poet recalling Dante than a high priest of science. In his rich melodious voice, Einstein thanked them for the hon-

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ors they had given him and concluded with an explanation of the deductive principles of research, by means of which he hoped to extend the sphere of reality accessible to human experience.

"I have to thank you most heartily for conferring the greatest benefit on me that anybody can confer on a man like myself," he said. "By electing me to your Academy you have freed me from the distractions and cares of a professional life and so made it possible for me to devote myself entirely to scientific duties. I beg that you will continue to believe in my gratitude and my industry even when my efforts seem to you to yield but a poor result."

Einstein gracefully brought this address to an end by expressing the hope that "our united efforts" would succeed in making permanent progress toward the solution of the still unsolved mysteries of physics, and his white-headed audience crowded about the speaker with the bushy black hair to offer him their friendship and their aid with as much enthusiasm as most of them were to show nineteen years later in banishing him.

Shortly after his arrival in the German capital, Professor Einstein remarried. The dreamy genius and his first wife, the Catholic girl of Slavic parentage who had been his classmate at the Zurich Academy, had failed to establish a permanent common ground. Their union was dissolved with mutual consent just before he left Zurich for Berlin. Like most geniuses, Einstein was wrapped up in his own creative energies, and this did not make him an easy man to live with. His wife had to be more than a companion to him. There were times when her rôle had to be that of a mother, a nurse and a manager, as well as a loving wife. Professor Einstein was lucky in finding this

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rare combination of virtues in Elsa Einstein, the daughter of Rudolf Einstein, his father's cousin.

The two had met as children in Ulm, Albert's birthplace, and later, when the family of the budding scientist had moved to Munich, Elsa frequently was a member of the picnic parties which Albert's mother organized to the near-by Bavarian lakes. Many years of separation followed, and the two met again as mature man and woman, in the bustling capital of Germany. In the intervening years, Einstein's cousin had married a fellow townsman from Ulm, but her marriage had been unhappy, and she, too, had been divorced.

An attractive and charming woman, Mrs. Einstein was as simple, modest and unaffected as her famous husband. Moreover, she possessed a characteristic sense of gaiety and good humor, which acted as a welcome counterpoise to her husband's scholarly interests. An old-fashioned woman who believed a wife's first duty was to take care of her home, she provided all the comforts of the fireside for the professor, while her unflagging devotion shielded him from the too inquisitive public. Her protective instincts were always busy to insure the maximum of peace and quiet so that her husband might work with a minimum of disturbing interruptions, and when world renown and honors were showered upon him she considered it her foremost duty to keep in the background rather than to share the fame of the achievement in which she had played no inconsiderable part.

For nearly a quarter of a century, until her untimely death in Princeton, New Jersey, toward the end of 1936, Mrs. Einstein was an important part of her eminent husband's career. She once laughingly said of him: "I man-

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age him, but never let him know that he is being managed!" The professor, who looked upon his understanding wife as his best companion, was deeply fond of her, and frequently paid tribute to her home-making talents. In one of his mischievous moods, when he knew his wife was eagerly eavesdropping, he told a group of friends:

"Mrs. Einstein is an excellent cook. Of course, if she weren't, I would have divorced her long ago."

She was never quite sure why her husband commanded so much public attention. But this did not deter her from doing her utmost to protect the sensitive scientist from the overwhelming public curiosity which he had aroused, and in response to the frequent question as to what it was like to be the wife of a famous man, she frequently replied:

"It is not ideal to be the wife of a genius. Your life does not belong to you. It seems to belong to everyone else. Nearly every minute of the day I give to my husband, and that means to the public."

In spite of the great difficulty of her task, she never complained. She was ready at all times to give of her utmost love and fellowship and understanding to her husband, never troubling him even for an explanation of his work. To surprised friends, she explained:

"You see, I'm not scientifically inclined. My husband's time is so valuable, I don't want him to waste it trying to explain his theories just for me. I am not talented in any direction except perhaps as wife and mother. My interest in mathematics is mainly in the household bills."

The Einsteins found an unostentatious home in Haberlandstrasse, a comparatively new section in the west end of Berlin, frequently called the Bavarian quarter because

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its streets are named after famous Bavarian places. Its broad streets, well-kept trees, and new, modern apartment houses made it popular with families of the middle and upper middle classes. There was a sameness about the newness and comfort of the dwellings, and about the Teutonic complacency of the inhabitants, which afforded a striking contrast to the rebellious spirit, the prophetic vision and childlike simplicity of the quarter's most distinguished citizen.

Einstein's house, unlike his mind and spirit, resembled thousands of others in Berlin. Surrounding it on all sides were similar dwellings which housed well-to-do, patriotic Germans, pleased with themselves and with the world as it was. It fronted on a small square, in the center of which stood a statue of St. George and the Dragon—a Teutonic St. George with a mien which seemed to reflect the self-satisfied smile of the hustling merchants and successful professional people of the neighborhood. Visitors to the four-story Einstein apartment house—and their number became increasingly numerous during the nearly two decades of the scientist's residence there—found a rather dull-looking porter in a blue denim jacket and apron, who turned the key in the lock and sent the crawling elevator up to the top floor to stop before a polished brass plate above the bell with "Professor Einstein" on it.

Puritan simplicity greeted them within the professor's home. Only the library, with its well-stocked built-in bookcases against the green wallpaper gave a clue to the scholarly character of the man who resided there. The living room was comfortable and cheerful, but the simple furnishings, the flowered yellow wallpaper, the prominently displayed family pictures, the portrait of Frederick

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the Great with his two dogs, and the piano in the corner which it adorned, were characteristic of thousands of other German homes in the city. Any visitor who sought a reflection of Einstein's genius and personality in his home was disappointed, unless he happened to be one of the very few who were permitted inside the carefully guarded doors of the professor's study.

In a little corner turret resembling an attic room about fifteen feet square, separated from the rest of the apartment by a staircase, two doors and a passageway, were the scientist's working chambers. Under the sloping alcove window was a round table on a dais, covered with a red and white cloth and littered with papers and pamphlets and tobacco ashes. Two ladder-back chairs, with straw seats, a couch, and shelves bursting with scientific books and magazines, and two fat Bibles, stood against the walls. On his desk was a picture of Newton, and opposite it was one of the two furnishings which surprised visitors most—a piano! The piano was his refuge when the wracking pressure of creative thought was more than he could stand. There, a bit of Beethoven or Bach restored his inner harmony and sent him back to the maze of unfinished equations which only he could understand.

One of the pleasant jokes of this colossus of mathematics was the little telescope on his table. Upon espying it, a certain visitor's eyes began shining with understanding: so that was the tool with which the famous man studied the heavens and obtained his amazing revelations from the far-off stars! But here Einstein, a twinkle in his eye, interrupted:

"No, my friend; I do not star-gaze. The telescope be-

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longed to the grocer who used to live here. I kept it just for a plaything."

But where were the scientist's tools? Einstein, now smiling broadly, tapped his forehead and said:

"Here are my instruments."

It was a simple life that the scientist led, with few material impedimenta. In his study and his offices at the Academy of Sciences most of his waking hours were spent. Rising usually about eight o'clock, he bathed and shaved as soon as his wife had filled the tub with water of the temperature he liked best. In spite of his growing income and the numerous presents of fine soaps of all kinds from his wife and friends, Einstein still insisted upon using a single brand of soap for both bathing and shaving. Two kinds of soap, insisted the author of the most complicated mathematical treatise known to man, were a needless complication of life. After breakfast, he filled his stubby old briar pipe and retired with a fountain pen and pads of paper to his study—and to silence, a four-dimensional world, and his own profound thoughts.

Einstein varied the routine sometimes with a lecture at the University of Berlin. These addresses were always well attended, in spite of a widespread notion that the theory of relativity was beyond the understanding of more than a dozen or so people of superior intelligence. As Einstein's fame grew, citizens of Berlin who were not students at the university began to shoulder the collegians out of their own lecture halls, and the cables of the world buzzed with the amazing news of a student riot in Berlin. The university authorities were forced to step in when the students, contrary to the traditions of other college youths, insisted on going to lectures—even if they

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had to throw out outsiders who were usurping their places! No one was more mystified by this unusual student grievance than the gentle scientist himself.

Another embarrassment to Einstein during these hectic years was the frequent question as to the hours he devoted every day to his work. "Working is thinking," he would reply, "hence it is not always easy to give an exact accounting of one's time." He sometimes asked a friend, an astronomer or a biologist perhaps: "How many hours a day do you work?" And when the friend replied: "Oh, eight or nine," the professor would shrug his shoulders and exclaim: "Ach! I cannot work so long. I cannot work more than four or five hours a day. I'm afraid I am not a very diligent man!"

But his friends knew that the pressure of work to which he subjected himself was frequently more than mind and body could bear. For he was always lost in thought, whether at his desk or on a tramp into the woods. Even when he appeared to be at rest, his mind was in the close embrace of his contemplations, and a friend who sought to divert his attention by a question to something external felt the jar, the effort required for the cosmic navigator to return from the stars to purely mundane matters.

Einstein locked himself in the world of his own thoughts more and more as Germany's unbridled nationalism and Europe's mad race of armaments at last led to the double murder at Sarajevo and to the tragic hour of midnight on that fateful fourth day of August when a bewildered Europe cast herself into the merciless arms of Mars. Berlin was in the grip of frantic patriotism, as the goose-stepping troops of the German Kaiser—who deplored the British "legalism" which did not agree with

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him that a treaty was "just a scrap of paper"—invaded Belgium and talk filled the air that the mighty German fleet was about to join issue with the "arrogant" British who had anchored among the Orkneys in an effort to blockade Germany.

Einstein looked on with horrified eyes as the flower of German manhood responded to the Kaiser's call to prove to the world that German national success was the will of God, an association of ideas which millions of obstinate Frenchmen and Englishmen and Russians failed to understand. And among the grim-visaged, determined young men who marched between madly cheering throngs on their way to meet the British at Ypres was a pallid-faced, obscure private from Austria with a luxuriant mustache which flowed over the corners of his mouth. A failure as an architect, as a house painter, as a carpenter and as a seller of postcards, this Austrian who had departed from Vienna only two years before had adopted Germany and the German army with a fervent, demagogic patriotism. To the gentle Einstein, he was one of the great multitude who, he sorrowed, were to be sacrificed on the battlefield when they should have been preserved to build a better world and a happy life for themselves. Of the marching millions many ended their days prostrate amid barbed-wire entanglements on shell-scarred fields, but the Austrian returned from the war, not as a builder of the better international understanding which the scientist had envisioned, but as a jobless ex-soldier who gloried in force, who wore the Iron Cross and a lance corporal's chevrons as if they were his passport to the seats of the mighty, and who carried with him an intense hatred which was to claim thousands of innocent victims,

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including the tender-hearted pacifist who most rejoiced at the return of peace.

Einstein's pacifism, which made him stand sadly aside while other Germans enthusiastically pushed the war for elusive glory, led his family and friends to fear for his life during the war hysteria. A large number of professors at the Academy and at the University distrusted the man who could see what lay ahead, and many considered him a revolutionary and an enemy. Although such charges made Einstein smile, they deepened his isolation and increased the fears of his wife. He felt very much alone on a bleeding continent given to thundering nationalism and frightful destruction. He could not bring himself to sign the so-called "not true" declaration to which 93 German scholars affixed their signatures in an effort to shift responsibility for the war from the shoulders of Germany. To Einstein, the responsibility for the war seemed of little moment; what mattered was to discover a way to avert another disaster of the kind and to create a peaceful fellowship of all nations.

While his neighbors gloried in the drowning of Lord Kitchener and in the sufferings of a Russian army equipped largely with clubs and shovels against German metal, or felt dejected over the successive retreats of the Kaiser's troops on the western front and the crushing blow of American khaki on French soil, Einstein was preaching the need of international cooperation to avert another war which would be "a matter of life or death for civilization." Force, he said, attracted men of low morality, and it was the duty of great men to awaken the conscience and the common sense of their fellow men so that people "will look back upon war as an incomprehensible

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aberration of their forefathers!" He believed that "the taking of an active part in the solution of the problem of peace is a moral duty which no conscientious man can shirk," and in a letter to Freud advocated an international association of outstanding moral, spiritual and intellectual leaders to mobilize world opinion toward the liberation of mankind from war.

Meanwhile, another heartrending sorrow came to Einstein with the news in 1916 of the arrest of his close friend and companion of Zurich days for having killed Count Stuerghk, Premier of Austria, as a protest against the war. The idealistic Adler was sentenced to the firing squad. Friends intervened, and the death sentence—to Einstein's great relief—was commuted to eighteen years' imprisonment. Adler won his freedom under an amnesty in 1918, and when the two joyous friends met again Europe was in the throes of reconstruction.

Einstein's friends in Switzerland had not forgotten him. During the war years and after, when famine was an ever-present danger for every German household, packages of food arrived regularly at the Einstein residence in Haberlandstrasse bearing Swiss postmarks. He had also maintained his friendship with Lorentz and other professors at the University of Leyden, and throughout the war Einstein escaped occasionally into the peaceful city in southern Holland to lecture at the University as a visiting member of the faculty. Lorentz and Einstein saw eye to eye not only on scientific problems but on the importance of international cooperation to maintain peace and promote human welfare, and their close association increased their mutual respect and admiration.

But the greatest comfort to Einstein during the war

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years was his own little study where he escaped into another world. Like Goethe and Lamarck and other great men whose outstanding work was done during fierce wars, Einstein sought and found in his work chambers a refuge from the suffering and destruction of the battlefield. He believed with Schopenhauer that one of the most powerful aids to great achievement in art and science is the ability to escape from everyday life with its painful dreariness and its chains of ever-changing desires. Einstein confessed that work drove his mind away from personal existence to a world of objective seeing and understanding; the spirit that moved him was comparable to the longing that draws one from his noisy, entangled and distressing surroundings "toward the quiet mountains where his far-reaching gaze penetrates the clear air and follows the restful outlines which seem to be created for eternity." The soothing vision of eternity replaced to a certain extent the unpleasant realm of mundane existence in his mind, and gave him the tranquillity and constancy which he could not find within the narrow circle of everyday experience.

During the trying years of war, Einstein succeeded in completing his general theory of relativity and followed that with important papers on radiation and the problem of matter. While the military machine was moving into action at Mons, the Dardanelles, the Somme and Verdun, while Germany was introducing unbridled submarine warfare in the Atlantic, and the priest Rasputin was being murdered at a house party in Petrograd, Einstein was waging and winning a battle the effects of which will endure long after the World War has been forgotten. The years of combat within the four walls of his study

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involved mental struggles, hardships and trials greater than any that faced Haig or Foch or Hindenburg. But, whereas the battles of the German army ended in Versailles with the degradation of Germany, the one-man war in the Einstein study was about to revive the old fame of the German spirit and was to go a long way toward erasing the sad memories of German militarism.

IV

THE AGE OF EINSTEIN

If my theory of relativity is proven successful, Germany will claim me as a German and France will declare that I am a citizen of the world. Should my theory prove untrue, France will say that I am a German and Germany will declare that I am a Jew.

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SPRING came to war-weary Europe in 1919 with a joyous abandon, stretching out her leafy arms and gladdening sunshine to embrace the earth. But there were few persons upon the blood-stained continent who, after nearly five years of the most frightful destruction in human history, were able to respond in like spirit to the carefree happiness of the new season. The virus of madness had left its indelible marks; and the men who marched past the gurgling fountains, the sweeping green lawns and the flowering orange trees set between ornamental bronze groups into the famous Gallery of Mirrors at Versailles wore an air of sorrow and grim determination.

It was true that Woodrow Wilson, welcomed by the Peace Conference as a new Moses, sought to inspire the delegates to rise above their implacable hatreds with a plea for lofty idealism and for his own fourteen commandments. But English interests came first and fore-

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most with the shrewd Lloyd George, who stood for the aspirations of the British Empire. And no one could make the aged Clemenceau, who had lived through another and less happy occupation of Versailles nearly fifty years before, forget the insult to his beloved France by the tricky, bald-headed, frigid Bismarck, who had desecrated the beautiful gardens of Versailles with the feet of Uhlans. There is no memory so sharp as the memory of hatred, and the barbaric Teutons who had dared to use the centuries-old shrine of French patriotism as the altar for the crowning of the first German Emperor, who had proudly studied their own reflections in the mirrors as they had indifferently shrugged to French pleas for civilized restraint, who had tartly boasted when threatened with another war that they were prepared to risk that, had to be made to pay for their tragic blunders.

But just as the great Pasteur had risen in despoiled France in 1873 to bring new glory to a country shorn of her greatness and to make his countrymen forget the holocaust of war, so now another figure, as simple and bashful as Pasteur was dynamic and spectacular, came to the fore across the Rhine to perform a similar service for blighted Germany.

Spring was about to turn into summer, and the weary delegates in the great palace at Versailles, after months of wrangling, were at last approaching the final draft of the Versailles Treaty—gleeful citizens of Alsace-Lorraine, happy to have the French tricolor over their heads once again, had already presented the conference with gold pens for the ceremony of the final signing—when two ships quietly sailed from London for two obscure locations. Two groups of famous English astronomers were

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aboard. The Royal Society of England and the Royal Astronomical Society had dug into war-depleted treasuries to finance two expeditions, the work of which was to focus the searchlight of world fame upon a dreamy, retiring German Jew in the enemy capital of Berlin with a brilliance and intensity to which few men have had to submit.

Astronomers perhaps suffer least from the passions of narrow nationalism. Their nightly vigils at telescopes, which take them on cosmic voyages through space, lift them above the turmoils of earthly existence. The heavens offer them a share of that spiritual enlargement which the starry firmament possesses so abundantly. While other scientists busied themselves by inventing more deadly poison gases, or by making more destructive cannon, and otherwise conducted themselves in a "superior" manner to earn distinguished service medals, astronomers, together with a few other men of science, remained far from the madding crowd.

With that mystic bond of fellowship which unites the privileged workers in the theater of celestial space, they enjoyed each other's respect and felt united, in spite of all differences of race and political creeds, in the common struggle to conquer ignorance. So when Professor Einstein in 1915 published his revolutionary general theory of relativity—radically expanding the special theory of 1905 to include any kind of motion, including rotation and acceleration, in a new picture of Nature—and pointed to an experiment which would test its validity, there were leaders of thought in England, such as Professor Eddington, who rose above the shackles of patriotism. The charge that they were "trafficking with the enemy" carried no

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weight with them. While the fury of war thundered slowly from enthusiastic jubilation to the inevitable end of sorrow and hatred, they waited impatiently for the opportunity which would come with peace to use their English instruments and their English brains to bring glory to a German. Their golden chance came at last, early in 1919.

In the spring of that year, a total eclipse of the sun took place along an almost inaccessible region near the equator. Toward the end of May, while the rose bushes at Versailles shone with new buds and Clemenceau was shaking the Hall of Mirrors with his thunderous demand that France be made safe from German violence, a group of Englishmen landed at Sobral in eastern Brazil and began to set up tons of delicate instruments. The *Galerie des Glaces* was witnessing a triumph of French diplomacy, the equal of any depicted in the paintings of famous French victories that looked down upon the embattled peace conferees, as a second English expedition maneuvered its way along the treacherous west coast of Africa to the lonely Portuguese island of Principe in the Gulf of Guinea. Here, less than a hundred miles north of the equator, in a torrid setting which is extremely favorable for the propagation of cocoa and sleeping sickness, and equally unfavorable for human beings, Britain's men of science made ready for the morning of the eclipse.

May 29, 1919, will go down through the ages, long after the peace conference in the great palace of the French kings is forgotten, as an epoch-making day in the history of the human race. Although total eclipses of the sun are in themselves remarkable enough to induce astronomers to travel halfway round the world and to

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face many hardships to study them, this one in particular proved to be a unique sensation. The shaggy-haired, solitary Einstein, who up to this time had been little heard of outside scientific circles, had said in advancing his new concept of nature: "Watch the behavior of starlight as it passes near the sun at the next eclipse for verification of this hypothesis." The prediction had set the world of science agog.

This intrepid interpreter of Nature had coupled the prediction with a new explanation of Nature's laws, which, if proved correct, would produce a profound revolution in man's conception of the constitution of the universe. Einstein's hypothesis altered all previous views of matter, motion, energy, space, time, light, and gravitation. As the foundation of the new theory, he offered a new explanation of the mysterious phenomenon of gravitation which made it necessary to reconceive the structure of space.

In his general theory of relativity he had ingeniously assumed that the presence of matter impressed a curvature upon all neighboring space. The amount of this curvature depended upon the quantity and distribution of matter, or, in other words, upon the strength of a star's gravitational field of force. The sun, for instance, thus distorts the space-time continuum in its neighborhood by an amount directly proportional to its mass. This curvature of space in its turn affects the motions of all moving bodies in the heavens, causing them to follow the curvature in their cosmic journeys because that is the easiest thing to do. Like many human beings, the stars in their courses are lazy; when they encounter the "hills and valleys" in the far-flung heavens caused by gravita-

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tion they prefer to avoid climbing the hills and to travel along the smoother course of the valleys.

The father of the theory of relativity had predicted that if this startling explanation of cosmic forces were true, starlight passing near the sun must be deflected or curved toward it by its gravitational attraction and by the geometrical modification of the curvature of space. He had even calculated the exact deviation of a ray of light from a distant star as it traveled past the sun on its way to the earth. This deflection of starlight, according to Einstein's prediction, should be 1.745 seconds of arc. Thus, a direct observational test of the new theory was offered to mankind.

In order to make this test, eager scientists had to wait for a total eclipse of the sun, for the stars in our line of view in the general direction of the sun are visible only when the sun's blinding glare is temporarily screened off by the moon. Photographs of these stars taken when they suddenly spring into brightness during an eclipse should, when compared with pictures of the same stars taken when the sun was in another part of the heavens, reveal the displacement, if any, in the star images. Since these stars were many millions of light years away, they were far from the influence of the sun's gravitational field, and the temporary presence of the sun in the same line of vision could not possibly have the slightest effect in altering their real positions. Thus any change in the position of the same stars which the comparison of photographs might reveal would be due entirely to the bending of their light as the moving rays passed near the surface of the sun on their way to us. The slight inward change of direction of the light rays would throw the images of

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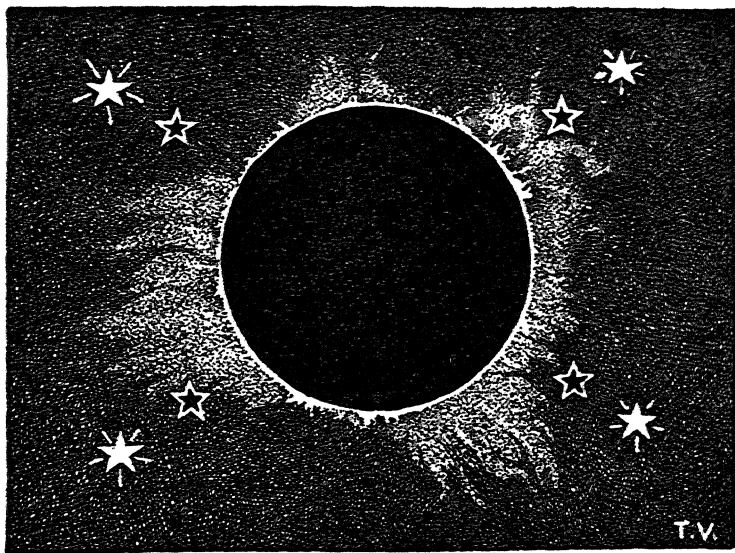
these stars away from the sun, causing an apparent displacement in their position. Here was a simple, easily verifiable test of the Einstein theory!

The morning of May 29 dawned cloudy, setting the English astronomers at both Sobral and Principe on pins and needles. Working under tremendous tension, they put the final touches to their preparations, hoping that when the "zero hour" arrived and the earth was enveloped in daytime darkness, a break in the clouds would permit them to obtain the precious photographs they had come so far to get. Placed in the position of playing dice with the weather man, the nerve-racked astronomers waited anxiously. Just as the moon began to bite a chunk out of the sun, the clouds moved apart, affording a splendid view of the magnificent corona and the all-important star images they had hazarded so many hardships and illnesses to photograph. The astronomers played hide-and-seek with the fleeting clouds, but every second of the two-minute eclipse which was free from the hampering clouds was put to good account as cameras clicked from every conceivable angle. The British men of science were as happy as their sedate British natures permitted them to be when they boarded ship with their priceless cargo to return to London.

With the return of these two expeditions, the world saw the end of one epoch and the beginning of another. For the British delegates from Versailles, headed by the indomitable Lloyd George and carrying with them the final signed draft of the peace treaty, arrived in London almost simultaneously with the astronomers. But while the black-frocked deliberators had brought the epoch of the World War to a close—and piously hoped that

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war itself would be ended by the League of Nations which they had evolved—the astronomical expeditions were opening a new era. For the comparison of the eclipse photographs with previously obtained records proved that starlight *was* bent in the gravitational field



THE STARS SPEAK FOR RELATIVITY

The four inner stars with dark centers are shown in their true positions as revealed by photographs taken of that part of the heavens when the sun was not there. Pictures of the same four stars during a total eclipse would show them in the false positions of the outer symbols. The bending of light rays, caused by the attraction of the sun, would lead to this apparent displacement in their positions.

of the sun as Einstein had predicted. And the amount of the deflection coincided almost identically with the calculations of the German savant. Here was proof on a

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cosmic scale of the validity of the Einstein theory, and a new epoch in science, one of the most fruitful in the history of man's search for knowledge, was inaugurated!

The results of the eclipse expeditions kindled a popular as well as a scientific interest of so sensational a character as to be unprecedented in the history of science. The world at large understood little of the intricate relativity theory, but it grasped quickly the significance of these photographs. The news immediately added fuel to the fires of public interest. Much to his own amazement, the shy, solitude-loving professor became overnight a world sensation and found enough publicity and acclaim heaped upon him to bring joy to a dozen prima donnas of the stage and screen. Until the English astronomers returned to London, Einstein was almost unknown outside the domain of science—thereafter his name was on everyone's lips and he belonged to the world.

Einstein was smoking his briar pipe with a group of friends in the after-dinner quiet of his fourth-floor apartment in Haberlandstrasse when a package bearing the legend of the Royal Society of England arrived. It contained a plate of the solar eclipse which confirmed all the revolutionary theories he had advanced about relativity, curved space and gravitation. He picked up the plate which his wife handed to him and uttered a series of birdlike chirpings of delight as he squinted at the maze of stars and gleaming streaks of light. Gone was the habitually dreamy expression of the scholar and in its place was obvious and unabashed pleasure.

"Isn't it wonderful that the Royal Society sent out expeditions and went to so much trouble to prove your theory, just as if there had been no war and Allied armies

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weren't occupying the Rhineland at this very minute," his wife remarked.

"Among scientists in search of truth wars do not count," was the quick rejoinder.

Still fascinated by the unique photograph, he continued to turn it in his hands and to squint at it with a fascinated air in the rapidly fading light of the northern city. At last a friend ventured:

"Aren't you glad that now it's all over, and your major theory is proved?"

A puzzled frown settled on the childlike features of the professor. "Proof?" he retorted. "As if there had ever been any doubt!" Knowing Einstein as they did, his friends realized that there was no braggadocio in that statement, and that the professor was speaking only from what to him was hard, cold reality. If he had solved his equations correctly, if his mathematical calculations were what they should be, there could be no doubt of the final result. And after mulling over his figures for years as he had done, he knew that his deductions were right. The glee with which he had been examining the photograph from London was not born from the pride of achievement. His naïve pleasure was due entirely to the magnificent beauty of the heavens pictured on the photograph!

It was ten years since Einstein had begun to blaze the trail that was to end in his new theory of gravitation, for which the total eclipse of 1919 afforded such spectacular proof. The fall of an apple, tradition says, gave Sir Isaac Newton his share of the truth about gravitation. Einstein was not so lucky. A fall also was responsible for setting him to thinking, but in his case the fall might

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have had serious personal consequences. One day he surprised his wife, who was unaccustomed to see him take any serious interest in the furnishings of his home, by pulling out a ladder and setting to work to change a picture on the wall. His mind, however, was not entirely upon his immediate objective, and, as he reached out too far, he tumbled from the ladder. Always the philosopher, Einstein noted his own sensations, wondering whether he was falling by the pull of Newtonian gravity or through grooves in space. He was surprised that he felt no sensation of falling whatever! The floor seemed rather to jump up to hit him than he to fall upon it. Unmindful of the few bruises he had suffered, he picked himself up, abstractedly waved aside his wife's anxious queries, and retired to his study to ponder over the puzzle. Years of intense mental ransacking followed and finally convinced him that Newtonian gravitation was at fault. It must be revised and extended before that puzzle could be solved; and out of this conviction grew a new theory which has unlocked some of Nature's most carefully guarded secrets.

Gravitation is the fundamental force of the universe. It is present everywhere in creation at all times. A too eager tennis player may hit the ball so hard that it will land on the ground far outside the white lines, but sooner or later it will fall on the turf. Were it not for the force of gravity, the tennis ball would keep on sailing through space, on and on, until it passed outside the earth's atmosphere and perhaps headed for Mars to investigate the rumors of warring Martians. But gravitation pulls it to the earth before it has gone very far. That same interacting energy holds our planet together against the disrup-

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tive tendencies which its own rotation generates and which otherwise would blow the earth and the human race to fragments. It causes the tides and the waves, it elevates the mountains and depresses the ocean basins, and it gives us our protecting blanket of atmosphere without which the earth would be a lifeless world full of meteorites and craters similar to the moon. Rain and snow, the erect posture of human beings and the stability of all moving vehicles—we owe all these to the astonishing attractive power of gravitation.

This supreme governing power controls the motions of the earth and of all the stars and galaxies in the far-flung heavens. Its undisputable dominion extends from the tiny world within the atom to the stupendous spiral nebulae hundreds of millions of light years away at the outposts of penetrable space. The very drama of the birth of the earth and the solar system, in the opinion of many astronomers, may be attributed to the same cause. For several billion years ago there was a romantic marriage between the sun and a giant passing star. The visiting star approached too close to the sun during its wanderings through the skies, and the mutual attraction of the two great luminaries set the stage for a rare celestial spectacle. The superior gravitational pull of the visiting star set into motion a tidal disruption which pulled out of the parent sun a stream of matter. This cooled to become the planets of the solar system, one of which has produced a race of human beings whose exact status in the cosmic picture is still a riddle.

The relationship of gravitation to the universe is one of the most magnificent problems which Nature presents. The greatest minds of the human race, beginning with

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the brilliant intellects of Egypt and Chaldea that laid the foundations of astronomy, and including those of Pythagoras, Ptolemy, Copernicus, Galileo, Kepler, Newton and Einstein, have struggled to find a satisfactory explanation of the nature of celestial motions. Homer gave voice to the notions of the ancients that all celestial movements were unimportant relative to the earth. The earth, occupying the position of supreme importance in the cosmos, was a great circular disk surrounded by the "River Ocean," with a solid vault above. The sun was the chariot of the sun god, who once a day drove across the heavens. At sunset, the sun god jumped into a row-boat and journeyed through the "River Ocean" back to the place of sunrise! The Hindoos expanded Homer's spectacular theory of how the sun and the earth move in relation to each other with an interesting variation of their own. On Homer's "River Ocean" they placed a gigantic turtle. On the back of this turtle stood four huge elephants whose eternal duty it was to support tirelessly the mass of the earth in space. Just what held up the turtle was a puzzle no one bothered about.

Ptolemy, to prove the correctness of the Aristotelian conception of a universe in which the earth was the fixed center about which the sun and all the stars moved, presented his geocentric theory. In this curious explanation of the mechanism of celestial motion, Ptolemy evolved a complicated system of cycles and epicycles which so congested the sky with planets, cycles and deferents that the ruler of Spain is said to have remarked impatiently to his instructor of astronomy:

"Sir, if I had been present at creation, I could have rendered profound advice!"

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The era which has given us Newton and Einstein, and with them a vast change in our conception of the nature of the universe and of the titanic forces operating in it, was inaugurated eighteen centuries after Ptolemy, when Copernicus and Galileo, defying the teachings of the Roman papacy, expounded the "pernicious" theory that the earth and the planets revolved about the sun as moths are attracted to a flame. Kepler, who discovered that planets move in elliptical orbits about the sun, imagined that a "spirit" exerted a moving influence from the sun with a power to attract other bodies. Newton went a great step further—just as Einstein, in his turn, was to go beyond Newton—with one of the greatest scientific achievements of all time, the discovery that Kepler's solar "spirit" was in reality the law of gravitation. Newton solved the problem of matter in relation to its motions and offered to mankind a set of laws which explained the operations of the force of gravitation. The great Newton, however, failed to give a satisfactory explanation of the *cause* of gravitation—a baffling problem which had to wait for another universe maker.

Newton destroyed forever all the legends and fables which the minds of mystified men had offered as explanations of cosmic motions. The earth yielded its place as the center of the universe, the complex structure of cycles and epicycles crumbled away, and the solar "spirit" faded into the imaginative limbo from which it had emerged. With a precision which centuries of scientists believed to be final, Newton determined the laws of planetary motions, and set forth, as the foundation underlying these laws, the all-pervading force of gravitation. Every particle of matter in the universe attracts every other particle, said

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Newton, "with a force that is directly proportional to the square of the distance between their centers." As two bodies move farther apart, the attraction between them lessens. Thus, if the earth, which is about 93,000,000 miles from the sun, were moved out to 186,000,000 miles, or twice as far, the sun's gravitational pull upon our planet would be only one-fourth of what it is at present. The amount of the attraction is also determined by size. The sun, being much more massive than our puny earth, has far greater gravitational pull, while our globe, in its turn, exercises a superior attraction over the lesser moon for the same reason.

Newton's revolutionary conception of a central gravitational force not only completed the Copernician system by clarifying the relative motions of the sun and the planets but went further and embraced the whole universe. So colossal was Newton's achievement that for two hundred years scientists believed that "Newton will have commentators but no successor." Newton was hailed as "the greatest genius" who ever lived, a cosmic explorer who had established a system of the universe "never to be shaken." Pope expressed the unbounded admiration of the ages in the pithy couplet:

Nature and Nature's laws lay hid in night;
God said, "Let Newton be!" and all was light.

The underlying mechanism in the Newtonian system was an active "force" which made its power felt directly in some unexplained manner through a space-filling ether. With the turn of the twentieth century, a regal successor to Newton had appeared who, with his special theory of relativity, radically modified the great English-

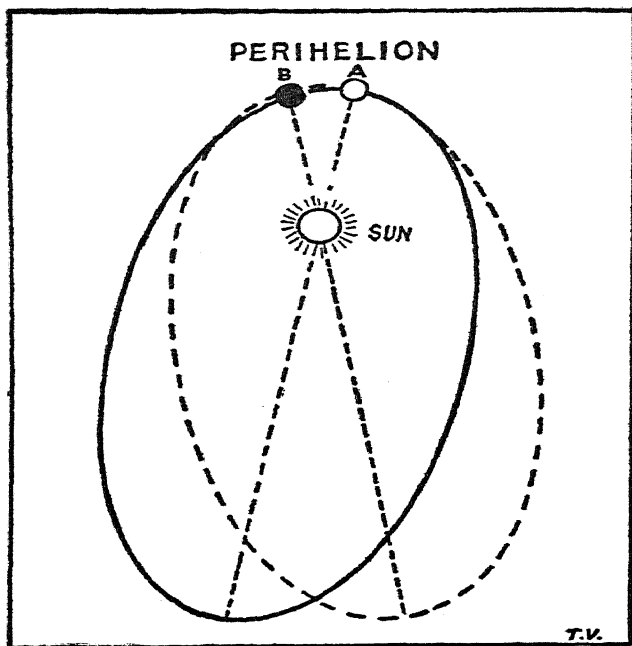
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man's concept of space by putting the idea of a tangible ether out of court. In his general theory of relativity, too, he was ready to throw out of court the Newtonian concept of an active "force" inherent in gravity and to substitute for it a new and much simpler scheme which blended matter and all its motions with space and time.

Einstein tackled this gigantic problem by again playing the rôle of a Sherlock Holmes with a success which would have made the famous Baker Street detective envious. His amazing powers of deduction were tested as never before. For nearly a century, the world of science had been puzzled and disturbed by an apparent aberration in the orbit of Mercury, the planet closest to the sun. Under Newton's laws, every planet revolved in a perfect ellipse about the sun as a focus, repeating these elliptical orbits indefinitely when not disturbed by the gravitational forces arising from other planets. But even after allowing for these disturbing influences, astronomers had found that Mercury refused to adhere to its cosmic schedule. The boiling-hot planet insisted on violating the celestial speed laws. In the middle of the nineteenth century, a Frenchman, Leverrier, calculated that Mercury, in reaching its perihelion—the point in its orbit closest to the sun—did not revolve exactly once around the sun from one perihelion to the next, but a little bit more. The discrepancy was not large. Leverrier calculated that in the course of a century it would amount to an angle of forty-three seconds of arc. But it is little things like this that keep astronomers up late nights and send them to bed lost in thought.

Mystified scientists, seeking an explanation for Mercury's violation of Newton's laws, watched the behavior

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MERCURY VIOLATES A COSMIC SCHEDULE

Scientists were bothered for a hundred years because Mercury in reaching its perihelion, or point closest to the sun, did not revolve exactly once around the sun from one perihelion to the next. It seemed to exceed the celestial speed laws by traveling a little bit more. In the course of a century, this discrepancy amounted to forty-three seconds of arc, represented in the diagram by A...B. Einstein's explanation of this "aberration" was one of the outstanding results of his general theory of relativity.

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of the other planets of the solar system. The gravitational influence of these worlds did have a calculated effect upon the course of Mercury, but the discrepancy of forty-three seconds of arc remained after allowing for all outside influences. Astronomers imagined the existence of an unknown planet or ring of planets between Mercury and the sun, speculated about other undiscovered forces of attraction within the sun or the solar system, but all such guesses created even more problems than they solved. For in every case the mass of matter required to produce the observed disturbance in Mercury's movement would have produced similar disturbances in the motions of the other planets. And no such disturbances in the behavior of Venus, the earth, Jupiter, Mars and the other planets could be found! These forty-three seconds of arc by which Mercury was exceeding the cosmic speed limit demanded a far more profound explanation than any scientific mind of the nineteenth century was able to invent.

Einstein was only thirty-six years old, a young man to whom the tragedy of war and the agitations of a mind constantly voyaging through unexplored seas of thought had brought signs of premature age, when he published his general theory of relativity in 1915. Once again, he had taken the pulse of Nature; and that Olympian achievement not only satisfactorily explained the enigma of Mercury but also gave to mankind a new scheme of reality in which gravitation appeared as another aspect of the space-time continuum.

Einstein's new theory flatly denied the Newtonian concept of force. The idea of a force which acted from afar to cause bodies, like an apple, to fall toward the earth and toward other great collections of matter, was another il-

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lusion—like the illusion of absolute space and time and motion—born of our fallible sense experiences. Human beings, with their well-known tendency to associate the unknown with familiar sensations, had fallen into the natural error of ascribing to Nature the same basis for dynamics which they use on earth. A horse pulls a carriage, steam pushes an ocean liner across the Atlantic, and other familiar forces enable city folk to leave their crowded centers and draw themselves to shaded country lanes or to breeze-swept beaches on a hot Sunday. Without the forces of pull and push, mankind can get nowhere; and so the movements of Nature, too, must be dependent on the same dynamics.

This concept of energy, which was the underlying mechanism of Newtonian gravitation, was overthrown by Einstein in his sweeping general theory of relativity, which revised, simplified and expanded Newton to give us a far better understanding of Nature's ways of doing things than we have ever had before. The motions of matter, said Einstein, are due not to any force but to the simple desire of moving bodies to follow the easiest way! There is a law of cosmic laziness throughout the universe, and moving bodies seek to avoid the difficult paths and to pick the easy ones as they move from one celestial rendezvous to another. And the problem of picking the easiest highways through space is simplified for them by the effects of gravitation.

To Newton, gravitation represented the mutual attraction of masses of matter, the power of bodies to influence each other in proportion to their size and distance from each other. Einstein, seeking the simplest basic laws upon which physics could rest, eliminated the concept of

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a mysterious force acting through a space-filling ether to control directly the actions of a body far away, and introduced in its place the concept of "the field." The gravitational power of a moving body, he explained, created a field of attraction about it, just as a magnet generates a magnetic field in its neighborhood. And, just as the field of the magnet attracts a piece of iron, so the gravitational field of the earth causes a stone to fall to the ground, and the solar field induces the planets to revolve about the sun.

The gravitation of the earth, and of other massive bodies, said Einstein, interacts with space and time in such a way as to warp space. This warping, or curvature of space, is greatest near moving bodies of large size and least at its greatest distance from the center of the disturbance. Thus, space near the heart of the gravitational attraction has a tendency to pull itself into a knot or hill. The greater the strength of gravity—the more massive the moving body—the more precipitous the hill in that neighborhood. The universe is dotted with such hills. As the gravitational field weakens, space simulates the slopes of a hill and, finally, a valley which curves about the near-by hill of gravity. So when one moving body revolves about another—or "falls" toward it—it is simply pursuing the course of least resistance. It is following curved space, choosing the valleys of the space-time continuum and avoiding the hills.

A motorist traveling from one town to another goes around a mountain which may be in the way in much the same manner. If such a mountain were located in the middle of a large valley in which numerous towns are located, the spectacle of motor cars running along the

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roads which curve about the mountain to get to the towns on the other side would be comparable to the behavior of the planets in the solar system. This analogy would be even more striking if we transported ourselves to an airship high in the heavens during the pitch darkness of night when neither the ground nor the mountain can be seen. Only the red beacon atop the mountain and the white headlights of the automobiles are visible. An unusually large number of cars are about, for half a dozen inmates of an institution for the insane have escaped and every available policeman is on duty to track them down.

The white lights—they belong to the police cars, but from our vantage point in the airship we cannot tell that—follow a straight course when far from the red beacon, but when they approach the red glare they turn sharply aside. The closer a white light comes to the red beacon, the sharper is the curve away from it. This mystifies us, and we conclude that the cars are repelled by some mysterious force in the red beacon—perhaps the red glare denotes a fire which will burn anyone not discreet enough to stay at a safe distance from it. But with the coming of daylight understanding also comes. Then we see the hill and the police cars—now returning in triumph with their prisoners—and we know that the red beacon had no influence whatsoever over the policemen, who probably never even saw the light on top of the mountain! The officers were simply following the curving paths in the valley because in the region in which they found themselves that was the easiest and quickest way to get from one town to another during their man-hunt. Similarly, says Einstein, to an observer outside our solar system ca-

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pable of seeing the whole celestial drama, the sun would correspond to the red beacon on the summit of the peak and the planets to the white lights. There is no force exerted by the sun to cause the planets to revolve about it, just as there is no force which causes water to fall to the sea. And, in the case of the planets, there is no eager beginning and no triumphant return. For they have no objective, and their courses are eternal.

✓ The stars, in pursuing the curved paths along the valleys of space, are not only following the easiest way but also the shortest and therefore the quickest way. The shortest distance between two points on a two-dimensional plane, as Euclidean geometry has proved, is a straight line. But on a curved surface, this no longer is true. A curve, or an arc of a great circle, then describes the shortest route. A Lindbergh flying from Panama to Ceylon, for example, would fly not across central Africa along the parallel of latitude which joins the two places, but would head northeast from Panama, across Bermuda, England and Poland, and, finally, head south from Russia and India to reach Ceylon from the northwest. This is the shortest distance between Panama and Ceylon, but on a map a chart of the course would appear as a long semi-circle. Space is no more flat than the surface of the earth. Just as the captain of a ship, or the navigator of an airplane, must move along a great circle to cover the shortest distance between two points on the earth's surface, so celestial luminaries must move in geodesics along the curvature of the space-time continuum which comes from the interrelationship of time, space and gravitation.

Now, the nature of these celestial geodesics is determined by curved space. Einstein tells us that the curvature

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of space-time is not everywhere the same. The amount of the curvature depends upon the quantity and distribution of matter. It is comparatively great near a massive body like the sun, and therefore causes the planets to move in ellipses. But if all the matter of our solar system were removed an infinite distance away, then the planets would move in straight lines.

This was the sensational deduction which Einstein—burying himself in his little Berlin study to forget the jubilations or sorrows of war witnessed almost daily in going to and from the Prussian Academy—had arrived at after long months of solitary meditation. Up to that time, science had followed Newton's teaching that light rays and other bodies tend to travel in straight lines unless acted upon by an outside force. But Einstein knew that if his deduction was correct there could be no straight lines in the universe, and light rays passing the sun would bend along the curvature of space in the solar neighborhood. Knowing what the mass of the sun is and the amount of curvature of space it would cause, he calculated just how much the light rays would bend in passing it. Sitting at his tobacco-sprinkled desk in his study in Haberlandstrasse, the professor was able to decipher another message of the heavens with greater success than he could exercise in mastering his pipe. The concepts of curved space permitted him to attack the mystery of Mercury from a new approach, and he predicted with his uncanny mathematical formulae exactly what the motion of the perihelion of Mercury must be. The stars in their courses were made to speak their own secrets. The study of Mercury, and the work of the British eclipse expeditions which followed publication of the new theory, proved the accuracy

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not only of these calculations but of the whole Einstein concept.

The hypothesis that all moving bodies have a curved path in the space-time continuum—which the study of the orbit of Mercury and of the total eclipse of the sun so spectacularly confirmed—was one of the two main physical foundations of Einstein's general theory of relativity. The other pillar of the new concept developed gradually in his mind as he meditated on his own fall from a ladder. As he mentally explored the innermost sanctuaries of Nature, it slowly dawned upon him that the traditional view based on Newton's teaching of the *cause* of gravitation was another fundamental error into which man had fallen as a result of the deception of his senses. So Einstein again broke with the past. Inertia and the attraction of gravitation, he boldly proclaimed, were not merely proportional to each other as the world of science had so long believed. The two were *identical*, each representing a different aspect of the same property of matter. This daring concept, which overthrew a point of view which had been religion to many generations of physicists, explained gravitation in terms of acceleration, and led to the formulation of the Einstein law of gravitation—a highly complex discovery which many scientists now consider his greatest achievement.

In everyday speech, particularly to those of us who drive a motor car, acceleration denotes an increase of speed. Used in its broadest sense, however, as it is by Einstein, acceleration does not mean merely a quickening of functional activity. It means *any* change of motion, not only in a moving body's speed but also in its direction. Thus, to a physicist a motor car which has just increased

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its velocity from 40 to 50 miles an hour, a train which was doing 60 miles an hour but is now doing only 20, or an airplane which veers from a northerly direction toward the east, all demonstrate the effects of acceleration. The more Einstein pondered the mystery of acceleration or change of motion, the more he became convinced that acceleration is equivalent to what we have always since Newton's time called "the attraction of gravitation"!

So in place of Newton's theory that gravitation is caused by an attraction or pulling toward "a center of gravity," the German savant offered as a substitute the explanation that acceleration, which is produced by the curvature of space-time, is responsible for the observed results of gravitation, such as the fall of all bodies toward the center of the earth or the movement of the silvery moon about our planet. It is no more accurate, said Einstein, to speak of the earth attracting its satellite, the moon, than to contend that the pockets of an uneven or "hilly" pool table attract or repel the ivory balls. Thus the idea of a pulling force, exercised by one body over another at a distance and without contact—the basis of Newton's explanation of gravitation—was wholly eliminated by Einstein in a concept which in its simplicity, universality and "naturalness" is one of the greatest scientific achievements of all time.

Why does a man fall off a ladder? Long after Einstein had forgotten the bruises from his own fall, he continued to ponder that question, searching for a clue that would lead him to a solution. Every schoolboy learns in school that a man falls off a ladder, or an apple drops from a tree, because the force of gravitation, which is inherent in the mass of the earth, pulls the falling object toward

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the center of our whirling planet.) But that is not quite the whole story. For every falling object is acted on simultaneously by two forces: one is the familiar attraction of gravitation and the other is the centrifugal force which the earth's rotation generates. This centrifugal force is one of the most important manifestations of inertia, the disposition of all bodies *not* to change their state of either motion or rest. Because of this universal property of matter, all bodies persist in their condition of rest or uniform motion unless some outside power forcefully overcomes the objection to change. The exercise of such power to the position of a body—or its inertial mass—will create a centrifugal force. A common example of this phenomenon, or the acceleration of a body which wants to maintain its inertia, is that of a driver who suddenly jams on the brakes of his motor car, or makes too sharp a turn on the highway. The bodies of the driver and his passengers have a tendency to persist in their previous motion, or inertia, and if the car be brought to a sudden stop from a high speed the centrifugal force born of this inertia may operate dangerously by hurtling the passenger beside the driver through the windshield.

Now this centrifugal force and the attraction of gravitation of the earth determine the weight of any body on our planet. An apple falls to the ground because the earth's rotation is comparatively slow and the centrifugal force which it generates therefore offsets only a small part of the earth's gravity. But if the earth rotated seventeen times as rapidly as it does, the centrifugal force at the equator resulting from our earth's inertia would exactly balance the attraction of gravity. The relation between centrifugal force and the gravitational force of the earth

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would be such that a body upon the earth apparently would have no weight at all, and there would be no "falling." An apple dropping from a tree, or a man losing his balance on a ladder, would fall not toward the ground but parallel to the earth's axis! And if the earth's rotation were speeded up even more, then all objects would fall perpendicularly away from the earth's axis. The earth's axis would be as repellent as a leper colony.

When a grocer weighs a pound of butter, therefore, he is merely measuring the earth's gravitational attraction! But this force of gravity is relative. Butter which weighs one pound in New York or London will weigh slightly more on a spring balance at the north pole and slightly less at the equator. Similarly, a French miner, if he used a spring balance, would be sorry to discover that his bottle of *vin ordinaire* had decreased in weight when he descended into a coal mine. Since weight is the amount of the force by which the earth attracts a body, the wine loses some of its weight in the bowels of our planet when part of the earth—and therefore its gravitational attraction—is above the owner of the bottle. The centrifugal force which acts against gravitation is greatest at the equator, where the rotation of the earth is greatest, but it is very small at the poles. Gravitation—with its effect on weight—is therefore measurably different at different places on the earth.

But this relativity of gravitation is not confined to the earth. It exists everywhere. The attraction of gravitation is an accidental value determined by the size, density and velocity of matter. If a young girl, for example, proud of her loveliness at "a perfect 120 pounds," were transported to the planet Jupiter, which is so massive that 1400 globes

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the size of our earth could be packed into it, she would be considerably annoyed by the change in her weight. Jupiter is so large that its gravity is two and one-half times that of the earth, and a girl who weighed 120 pounds on earth would tip the scales at 300 pounds on our sister planet. A massive young woman of 300 pounds would be very popular with the Hottentots, who measure beauty by tonnage, but the same young lady would simply be another wallflower, we fear, in her Long Island country club set!

But changes in the weight of a human being bent on cosmic travels depend largely on the destination he has picked. The same young lady who discovered, when she got off a rocket ship at Jupiter, that all her careful dieting and self-sacrifices to maintain herself at her perfect weight had been in vain, would find herself in an entirely different predicament if she took a flying visit to the moon. For our silvery satellite is comparatively so small that it has only one-sixth of the gravity of our earth, and our beauteous visitor would find her weight shrunk to only 20 pounds! What an orgy of butter, potatoes and rich pastries she could treat herself to in an effort to increase her weight beyond that of a six-month-old infant on earth!

Her loss in weight, however, would be compensated by a tremendous gain in agility which would enable her to break all male-made world records without trying very hard. She would need only five or six strides, for example, to complete a 60-yard dash in about two seconds flat—well under the world record of 6.1 seconds! And if she were to stop beside a lunar crater to watch a baseball game, what a spectacle she would see! A hit sails out to

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center field, and the batter skips around the bases, taking 30-foot strides—three steps to a base—twelve and he is home. But wait—it is not a safe hit after all! Through her powerful field glasses, our fair visitor watches amazed as the center fielder dashes a few steps backward—now he is nearly half a mile away—then jumps up twenty-five feet to snare the ball. The batter is out, and the crowd goes wild with excitement. But no sound reaches our fair traveler—for the gravity of the moon is not strong enough to hold a blanket of air about it, and without air there can be no sound. That settles it for our earthly explorer—what good is any sports spectacle without shouting crowds, the cries of the officials and the players, the noise of bands, anyway—and she runs for the rocket ship which is about to leave for earth and home!

If the young lady were an Einstein, she might conclude, upon her return home, that since weight, velocity, gravity, all appear to be relative qualities which shift with one's location, all three forces must be closely linked together. In fact, that is exactly Einstein's conclusion. The effects of gravitation, he holds, are indistinguishable from those of acceleration, or changing motion. Guided by this principle, he was led to his famous law of equivalence:

"A gravitational field of force at any point of space is in every way equivalent to an artificial field of force resulting from acceleration, so that no experiment can possibly distinguish between them."

In Einstein's hands, this was an essential clue—as important as the discovery of a trace of blood for Sherlock Holmes—which led him to the conclusion that the apparent force which gravitation exerts arises solely from acceleration, and the mass of a body is determined, in its

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turn, by the amount of force required to produce a given acceleration. The more massive a body is, the larger the force needed to change its motion by a given amount, just as a loaded freight train of only ten cars can be moved at a speed of twenty miles an hour by an ordinary engine, whereas a train of twenty cars must be pulled by an unusually powerful engine to attain the same velocity within a given time. Put in another way, this statement simply says that if the same force—in this case the same engine—acts on two different bodies which are at rest, such as two freight trains of unequal length—the resulting velocities will not be the same. The velocity, explains Einstein, depends on the mass of the body acted upon, being smaller if the mass is greater. In the case of the two freight trains, for example, the larger, twenty-car train will move more slowly than the shorter, ten-car train. Therefore, adds Einstein, we know how to determine the mass of a body, or, more exactly, how many times greater one mass is than another. Having identical forces acting on two resting masses, and finding that the velocity of the first mass is twice that of the second, we conclude that the first mass is two times smaller than the second. Mass used to be regarded as a quantity of matter which was invariable. Einstein, however, taught that mass is relative to an observer, like space and time, and is altered by motion in exactly the same proportion.

In his dramatic attack upon the mystery of matter, Einstein next proved that the gravitational effects of a moving body are characterized by the location of the body in space. He went back to the famous experiment of Galileo to prove his thesis. For two thousand years, up to the time of Galileo, the teaching of Aristotle that heavy

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bodies fall faster than light ones had been accepted universally as correct. But Galileo, earning a salary of fifteen cents a week as a young professor of mathematics, demonstrated to his dumfounded colleagues that—when the resistance of the air is eliminated—a feather will fall as fast as a piece of iron. Likewise, throughout the solar system, a tenuous comet has the same acceleration toward the sun as a massive planet if comet and planet are at the same distance from Old Sol. Einstein therefore reasoned that all bodies behave exactly alike in any given gravitational field, and that the power which gravitation exerts over a body depends only upon the *location*, and not at all upon the *nature*, of said body.

Let us imagine, said Einstein, a group of human beings enclosed in a large room-like box which is falling freely in the gravitational field of the earth. Since no one within the compartment can see the motion with reference to fixed objects outside, our passengers will be unaware that they and their box are falling. For them, gravitation does not exist! If one of the passengers were our fair lady who traveled to Jupiter and the moon a little while ago, she might take out her powder puff to pat away an imaginary shiny spot on her nose, and accidentally drop that essential aid to feminine beauty. Would the powder puff fall to the floor of the box? No, says Einstein, it would not. It would remain suspended in the air, right beside the young lady, because she, and the powder puff, and the box would all be falling with the same accelerated motion. If she wants to recover her powder puff, all she has to do is to reach out and pluck it from the air!

The passengers in our falling box have no sense of being pulled down by a supposed attraction as long as the

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box is moving with the natural, unopposed speed due to gravity. But this lost sensation can be artificially restored if a hook to which a rope is attached is tacked to the top of the compartment. Now, if a constant force is exerted by pulling the rope, the motion of the falling box is checked and immediately our passengers begin to feel all the effects of a gravitational field. Their feet will press to the bottom of the box (an effect of inertia and its aversion to change) and perhaps our young lady will even scream a little. If she were to drop her powder puff, now, or even a hammer, the dropped article would appear to fall to the floor, although actually the floor of the box will have risen to meet the object. Any traveler in a rapidly moving elevator feels a similar sensation. When the elevator begins to rise, his feet press more heavily on the floor, as if the attraction of gravitation had been suddenly increased; and when the elevator drops too fast his feet seem to rise from the floor and there is a peculiar "sinking" sensation in the pit of the stomach. When the elevator rises, he *gains* in weight—as if the motion of the car had created gravity—and every time the car slows down he *loses* weight. If the elevator were to travel upward so fast that it attained an acceleration equal to that of gravity, or 32 feet gain of speed in each successive second, his weight would be doubled. On the other hand, by shooting downward with the same acceleration, his weight would be entirely eliminated. The interaction of acceleration, inertia, and gravitation tend to increase or decrease weight—which is to say increase or decrease gravity—in accordance with the motion of the body in which we find ourselves.

Experiments like this, explained Einstein, show that gravitation does not exist absolutely, that it is a relative

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force. Acceleration, motion, gravity, inertia and mass are not independent of one another, as physicists once believed, but are related, and must be regarded as parts of one vast system which embraces all nature and manifests itself in different ways according to different circumstances. Energy, too, he added, belongs in this synthesis, and one of the most surprising conclusions drawn from relativity is that matter and energy are so inextricably bound up together that they cannot be separated. Regarded as separate quantities before the era of Einstein, mass and energy are now regarded as a single entity. Matter, reasoned Einstein, represents energy in its greatest concentration. Matter may be converted into energy, and energy into matter—the same property now masquerades as one, then as the other. Moreover, energy is similar to mass, and can exercise the same magnetic pressure as matter. The so-called “law of the conservation of matter” and the so-called “law of the conservation of energy” of Newton’s day must now be changed to read “the law of the conservation of mass-energy.” Thus, when a body absorbs energy by becoming hot, its mass increases; on the other hand, the sun, which radiates away 4,200,000 tons of energy every second, is gradually, albeit very slowly, becoming smaller and its gravitational power is consequently becoming weaker. If this process continues indefinitely, millions of years hence the sun will have radiated away its whole store of energy—it will have melted away in space—and the distant observer upon Arcturus may see the end of a once proud luminous body together with the doom of the earth and all the other planets dependent upon it for existence.

Although Einstein is primarily a mathematician and

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a physicist, one of the most important consequences of his theory of relativity has been in the field of astronomy. No listing of the ten greatest astronomers of all time is ever prepared by astronomers without the name of Albert Einstein, the only living man so honored. Einstein's theory of relativity, with its principle of the curvature of space, has led astronomers to drop the traditional view that unsounded depths of space stretch interminably away from us in all directions. Now they prefer to think of the cosmos as Columbus and Magellan thought of the earth—something enormously big, but nevertheless not infinitely big, a universe whose limits are finite.

A quarter of a century ago, most astronomers were inclined to believe that the universe is infinite in size. It was impossible, they contended, to imagine an end, or an edge, to the cosmos. Since the advent of relativity, however, the concept of curved space has enabled astronomers to swing toward the idea of a finite cosmos and to visualize the universe as a gigantic sphere or globe or cylinder, without boundaries and therefore without edges. Just as a traveler on earth may head for London, Paris, Moscow and Tokyo, and eventually find himself in his own backyard again, if we could travel straight on through space long enough, we would curve back on ourselves and return to our starting point. One of the most interesting speculations raised by this theory of a finite universe is whether the gigantic spiral nebulae which we perceive at the outermost limits of the cosmos may not, in reality, be rear views of the same star families which we see closer at hand in the opposite direction. It may also be possible, according to Russell, that we see some apparently gigantic luminaries in the depths of space

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which do not exist at all—which are simply “celestial ghosts”! Light rays emanating from a distant star may complete their journey around the cosmos in a thousand million years to meet again at their point of origin. But the radiating body from which they sprang has moved, in the meantime, to another part of space and the reunion of the light rays will merely present an image of the star as it was a thousand million years ago. The image which we then see will be simply an illusion of our sense of sight. If this theory be correct, some of the luminaries which we now glimpse in the heavens may be merely ghosts revisiting the scenes of their childhood.

If our universe had contained nothing but space without matter, it would have been indefinitely large. It would have been infinite in extent, exactly alike in every part, and would have no curvature. Before Einstein’s theory of relativity, space was believed to have no properties except extension—all its elements were intrinsically of the same nature, and it extended to infinity in all directions unless it were abruptly ended by something that was not space. But with the theory of relativity was born the concept of matter impressing a curvature on space through the attraction of gravity. There no longer was any serious obstacle in the way of the theory that space is finite, and astronomers, choosing that concept as preferable to the idea of infinity, went so far as to calculate the size and shape of the cosmos.

Since the curvature of the space-time universe is determined by the distribution of matter, Jeans pointed out, the volume of space and the distribution of masses inside it must determine the curvature of space-time at every point. The curvature, in its turn, must fix the volume.

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Thus, because of this intimate partnership between space and matter, a universe of a certain size must have a definite amount of matter if it is to maintain itself at that size. On the other hand, a given amount of matter requires a universe of a certain definite size in which to exist. The relationship between matter and space is such that each determines the quantity of the other! In somewhat the same manner we may speak of matching a shoe of a given volume with a foot the dimensions of which call for a covering of certain dimensions. In the simplest cases in which matter in the universe is supposed to be spread uniformly throughout space, Jeans calculates that the total mass of the universe is proportional to its radius, or, what is the same thing, that both the mass and the radius of the universe vary inversely as the square root of the density of matter. In other words, a great amount of matter requires a large universe in which to exist, and exists in this universe in a highly attenuated state, whereas a small amount of matter can get along in a small universe in a state of high density.

The picture of our universe which grows out of these concepts need have no center and need not be spherical in shape. It is possible for it to have a cylindrical structure. Hubble has estimated that this Einsteinian universe is a colossal system more than 6 trillion light-years in diameter which contains more than 500 nebulae, or galaxies, each stellar unit being 80 million times as bright as our own sun and about 800 million times as massive.

New philosophies, not only of the universe and of Nature's laws, but also of human behavior, have been inspired by Einstein. The picture of reality which he has given us, paints Nature as operating without a central

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government, abhorring force and given to universal laziness. The traditional views of cause and effect have been proved false by the new conception of time and curved space. We have had to drop our cocksure interpretation of the physical world in terms of absolute values in favor of a new understanding which presents Nature to us in abstract mathematical knowledge and relative values. If human beings were to draw upon the examples of Nature for guidance as to their own conduct, anarchy, independence, individualism and the course of least resistance might become man's ideals. In Newton's scheme of Nature, the sun was an all-powerful ruler, who governed the planets from the center of the solar system by the force of gravitation. But with the elimination of the sun as a monarch whose behests other moving bodies must obey, with the abolition of force, our universe no longer appears dynamic in the sense of an energetic, forceful titan. Bodies move in the universe with the least amount of hustle and bustle, in a manner which is least troublesome for themselves, and with no thought for the past or the future. Every moving body in the universe lives its own life in the way which suits it best, minding its own business and never coming too close to the other inhabitants of the heavens. A minute is a bit of space-time and there is no absolute significance to the "now" in the cosmos—there is no Becoming, only Being. And, in the words of the poet, the whole universe with its far-flung domains appears as

An all-embracing ocean-tide,
On which we and all the Universe
Swim like exhalations, like apparitions
Which are, and then are not.

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Although men and women of all shades of opinion, from pacifists and theologians to anarchists and generals, have sought to extract support from the theory of relativity for their own pet opinions, Einstein has steadfastly refused to confuse his scientific work with pure philosophy. He was content, under the drive of an intellectual passion which few men have possessed, to seek the simplest basic laws upon which science could rest. So well did he succeed, with his inexhaustible patience and endurance, in his effort to behold creation through knowledge, that the mathematical Apocalypse in which his theory of relativity was couched is now regarded as the most important document of the twentieth century.

Before Einstein, a material object was commonly conceived of as existing in space, in time, in a gravitational field, and in an electromagnetic field, each object thus having four different backgrounds. In his special theory of relativity, Einstein amalgamated space and time into a single plan, space-time, while the general theory of relativity, with its four-dimensional Riemannian geometry replacing three-dimensional Euclid, further absorbed the gravitational field into space-time. Thus, Einstein reduced three of the four backgrounds to one. In two papers published in 1929, he sought to avoid the dualism which the gravitational field and the electromagnetic field exhibited in former theories as independent constructions, by offering a partial synthesis of the two which he called "a unified field theory." This brought at least two cases of electromagnetic phenomena into the field of relativity and demonstrated "both types of field as manifestations of one comprehensive type of spatial structure in the space-time continuum." The "unified field" theory, in its

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partially successful attempt to develop a single mathematical formula from which the laws of gravity and the laws of electromagnetism can both be derived, took a long step forward toward the achievement of a single primary law which would contain, or be essentially connected with, all other laws of the physical world. The unification of the varied phenomena of the universe under one law has long been a cherished dream of science.

The structure of the special and general theories of relativity demonstrated the interrelationship of time, space, matter, gravitation and energy in a new conception of the universe and led scientists to believe that the unification of the universe under one law was not as fanciful a dream as was supposed. Since his harvest year of 1915, Einstein has bent his energies toward creating a general field theory in which space, time, matter, electromagnetic and gravitational phenomena will be united in a theoretical unity. Describing his new aim, shortly after the publication of the general theory, he pointed out that "space, brought to light through the corporeal object, raised to scientific reality through Newton, has in the last decade consumed ether and time and is about to consume field and corpuscles so that it remains today the only theoretical representative of reality."

The dagger of Einstein's mind has torn away a large section of the veil of ignorance before our eyes and has opened up a new vista of Nature. Today he is still pursuing his profound explorations in the innermost citadels of Nature in a superb effort to bring about a wedding of all physical phenomena under one mathematical scheme, confident that his belief in the inner harmony of our universe will be vindicated.

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"Reality created by modern physics is far removed from the reality of the early days," he points out in justification of his vision. "But the aim of every physical theory still remains the same. With the help of physical theories we try to find our way through the maze of observed facts, to order and understand the world of our sense impressions. We want the observed facts to follow logically from our concept of reality. Without the belief that it is possible to grasp the reality with our theoretical constructions, without the belief in the inner harmony of our world, there could be no science.

"This belief is and always will remain the fundamental motive for all scientific creation. Throughout all our efforts, in every dramatic struggle between old and new views, we recognize the eternal longing for understanding, the ever-firm belief in the harmony of our world, continually strengthened by the increasing obstacles to comprehension."

Ever since the cave-dweller first had leisure to think beyond his daily needs, man has watched the riches of the heavens and has groped for the ultimate key that would unlock the underlying unity of the vast heterogeneity in size, structure, distance and age of the universe. From his vantage point on the puny earth, a pebble on the celestial beach, humankind has yearned for understanding of the trend and purpose of celestial activity, of the origin and destiny of the universe, of the meaning of life.

Probably the basic facts of our bewildering and far-flung cosmos continue to elude us. The achievement of the great dream of unity—the discovery of what Einstein has described as "the inner harmony of our world"—may have to wait for a more profound understanding of the

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riddle of the world of atoms, electrons and protons. We are still in the misty morning of knowledge, fighting our way through jungles of ignorance, burdened with superstitions, mental illusions and inherited prejudices. We are putting together the pieces of a jig-saw puzzle, constantly gaining a new outlook and a fuller realization of the universe in its amazing complication as we go along.

The vision of achieving ultimate unity and harmony had seemed fanciful and impractical until Einstein. Man's finite mind has never grasped the architectural unity of creation in its completeness, and it may be that such knowledge is forever beyond the power of finite intellect to comprehend; but the profound genius of this universe maker has succeeded in bringing mankind closer to realization of this age-long dream than any other pioneer in the adventure of thought since man first appeared on this whirling bit of star-dust.

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Let every man be respected as an individual and no man idolized. It is an irony of fate that I myself have been the recipient of excessive admiration and respect from my fellows, through no fault, and no merit, of my own. The cause of this may well be the desire, unattainable for many, to understand the one or two ideas to which I have with my feeble powers attained through ceaseless struggle.

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Bravo!

OTTO KNIESCH was a frankly bewildered man. As he went about his duties in his faded blue denim jacket and apron, he wondered whether the world had gone crazy. The more he scratched his head, the more he meditated as he swung his broom with a zest born partly of Teutonic muscle and partly of irritated puzzlement, the more baffled he became. For years he had prided himself that the house over which his broom held sway was a model establishment of its kind along the tree-bordered street which faced the statue of St. George and the Dragon in the square. Everything had operated quietly and smoothly and with an efficient routine. But now all that had suddenly changed. And to add to his astonishment it appeared that the man who throughout the years had

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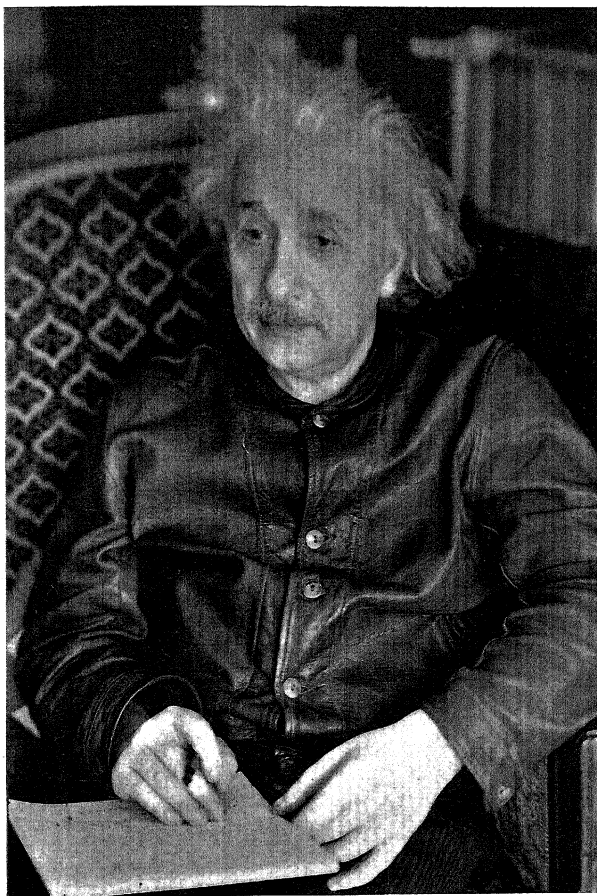
given him the least trouble of all his tenants was to blame for the change. Poor Otto could not understand it.

He took another peek from behind the corner of the curtains in his den. Yes, they were still there. They had parked themselves on the sidewalk in droves now for weeks, and as summer turned into autumn, and as frost heralded the coming of winter, the situation grew no better. They would not take "no" for an answer, these persistent reporters, photographers, autograph hunters, and idle curiosity seekers who waited eagerly for a glimpse of the famous professor or for an opportunity to exchange a few words with him.

In his many years as janitor of the Haberlandstrasse establishment in which the Einsteins made their home, Otto had learned to admire his tenant on the top floor. The professor, in the humble janitor's estimation, was the friendliest man in Berlin. The other dwellers in the building responded courteously enough to Otto's greetings, but somehow Otto always felt that they expected him to speak first and with a proper amount of deference. But the gentle professor was different. No matter how preoccupied he seemed to be, he was always ready with a cheery good morning when he espied the caretaker. He never waited for Otto to greet him first, but called out "Guten morgen, Otto," as if the janitor were his equal.

"There's a fine man for you," Otto proudly confided to the other caretakers along the street. "He never puts on any airs. He never fusses around, never complains, never scolds. And at Christmas he is too generous for his own good. Proud I am to be working for such a great man."

So when others shared his admiration, Otto readily



WITH FOUNTAIN PEN AND PAPER AS HIS "TOOLS," THE PROFESSOR GRAPPLES WITH THE MYSTERIES OF THE UNIVERSE

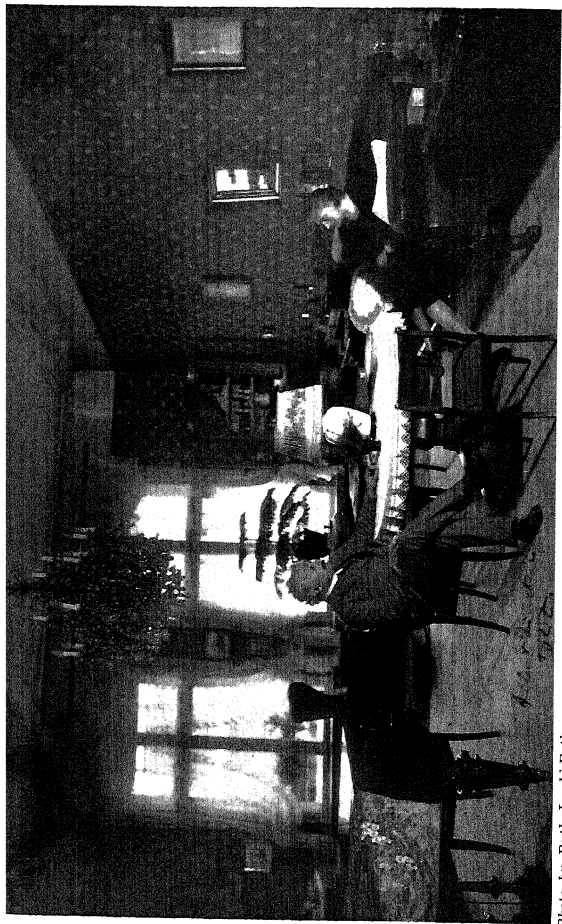


Photo by Ruth Jacobi-Roth

PROFESSOR AND MRS. EINSTEIN AT HOME IN BERLIN

This picture, taken in 1927, has Einstein's autograph in the lower left-hand corner

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understood and sympathized. But what he could not understand was why such tremendous popularity, so much attention and furore, should burst upon the quiet household of the professor so suddenly. It was obvious that the professor had not sought and did not welcome the sensation he was causing. Yet visitors from the four corners of the globe clamored for admittance past the front door over which the puzzled janitor stood guard with his bunch of keys. Students and scientists wished to consult the perturbed Einstein. Editors begged him for interviews. Women pleaded for advice about their love affairs. And there was both amazement and pride in Otto's voice as he related excitedly to his cronies that a movie company "wants to pay him \$40,000 a week if he will only let them make a picture of him!"

There was one person who shared all of Otto's bewildered amazement. He was the distinguished scientist himself. When the public uproar first broke over his head with the publication of the reports of the English astronomers in support of his cosmic discoveries, Einstein was surprised by the acclaim and dismayed by the prospect of public invasion of his privacy. Public applause, so sweet to a prima donna, had no meaning for Einstein, who hated all fuss and feathers. Moreover, he feared that any loss of his beloved solitude would curtail the leisure which he needed for his creative labors. Einstein believed that his popularity was a passing vogue and that the public would soon return to its accustomed indifference. "Elsa," he confided hopefully to his wife, "this won't last; it can't last; people have just gone temporarily crazy and tomorrow they will forget all about it!" Many sociologists, familiar with the ephemeral moods of public favor,

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agreed with Einstein's prediction; but with the passage of time, a world which understood little or nothing of Einstein's ideas but somehow grasped that he was a mental Hercules, a great man who did not think himself so, showered hero-worship upon him in ever-increasing measure.

His own native land, shorn of its greatness by the Versailles treaty, the details of which became public almost simultaneously with the reports of the eclipse expeditions, turned to him as to a Messiah who was to lead it out of the wilderness of defeat and degradation. But Einstein's appeal was not confined to his fatherland; it was universal. Few men in any age have so thoroughly captured the imagination of the world. In the annals of science, his spontaneous and universal popularity is unique, forming as great a landmark in sociology as the theory of relativity proved to be in astronomy and physics.

At the time that world-wide applause burst upon him, Einstein's special theory of relativity was fourteen years old and the general theory was four years old. Well-read scientists were familiar with his work, but there were few among the general public who knew of Einstein. The number of persons who were acquainted with his theories were fewer still. So when the world at large, in perhaps the most curious phenomenon of post-war history, decided to place this mixture of genius and child on its highest pedestal as its hero, it did so with little knowledge of his scientific accomplishments. As Bertrand Russell observed, "Everybody knows that Einstein has done something astonishing, but very few people know exactly what it is that he has done." The unintelligibility of his work to most people seemed to heighten the mystery and the

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charm of Einstein. In the decade that followed the world fame of Einstein, nearly 5000 books and pamphlets were published seeking to explain his theories for the benefit of the layman. But the attitude of the public remained something like that of the Methodist minister of the Compton family.

Some years ago, when Dr. Karl T. Compton, now president of the Massachusetts Institute of Technology, sought a bride, he and his fiancée were being entertained in the home of her most admired and respected friend—the pastor of her church. After dinner, the minister, by nature more poet than scientist, asked the scientist and bridegroom-to-be to explain to him in simple language the essentials of the Einstein theory of relativity. He listened with apparently absorbed interest to the efforts of his visitor to explain the Einstein ideas in non-technical language. Next morning he took the bride to one side and remarked: “I approve of your young man in all but one respect: he has no sense of humor. I asked him to explain to me Einstein’s theory of relativity and he really tried to do it. You are taking a long chance in marrying a man who has no sense of humor!”

But while the public was in a quandary which matched that of the pastor, this lack of understanding did not lessen its admiration. On the contrary, the mystery of Einstein’s work seemed to heighten its regard for him as a lion of the mental realm. People had no doubts about Einstein’s greatness. Scientists told them, and they readily believed it, that here, in the modest top-floor apartment of a middle-class Berlin flat lived the supreme intellect of the age, a regal successor to Newton and a mind far greater than that of any of the statesmen and generals

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who had cast humanity adrift on the quicksands of war. Here was an all-conquering Napoleon whose Austerlitz was his own study and his own soul, a great man and, moreover, a good kindly man who wanted nothing from his fellow men but the privilege to be of service to them; and—without counting on the relentless Otto, determined with all his power to shield his beloved professor from annoyance—they flocked by the thousands to see him.

Pitchforked by fate from relative obscurity into the blinding glare of fame overnight, Einstein was now appalled by his sudden popularity. When he ventured into the street, his appearance was the signal for eager reporters, press photographers and movie men to get busy. Interviewers, lion-hunters, cause-promoters, scientists, society matrons and reflected-glory chasers of every kind swarmed into his life. Those who could not hope to see him, wrote to him. The avalanche of mail was so great on some days that Otto could transport it to the Einstein apartment only in large baskets. Men of renown in their own spheres of activity, including statesmen, pacifists and leaders of social causes, as well as men and women of humble rank, such as unemployed workingmen, students and even love-lorn ladies, wrote to the man who had become a demigod in spite of himself, pleading for help and guidance. The need, the despair, the foolishness and the warm-heartedness of humanity poured forth from these letters. People turned to him as if he were a priest with miraculous powers to bestow help and healing. In the public mind he seemed to combine the virtues of a Sir Galahad, a Socrates and a Rockefeller. He was asked to solve intimate family problems. The poor begged for

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money or for jobs. A young woman volunteered to become his disciple in "cosmic meditation." A young man who wanted to become an explorer asked Einstein to get him to the jungles of Asia. Actors urged him to become their manager. One man "invented" new senses in the belief that Einstein had proved that the familiar five were no longer enough. Inventors wrote him about new flying machines, new washing machines and an "infallible" method to make everybody rich. Babies were named after him and a cigar manufacturer produced a new brand called "Relativity." Professor Einstein had become the commissioned guide of mankind.

His tremendous success inevitably aroused envy and misrepresentation. Some said that there was nothing new about the theory of relativity; that Einstein was a charlatan, an intellectual nihilist, an unscrupulous academician who had stolen from the more original minds of Edgar Allan Poe, Mother Eddy, St. Thomas Aquinas and Robin Hood. Still others accused him of propounding ideas so radical, so far beyond the ken of human beings, as to constitute a menace to science, religion, democracy, the price of wheat and the sanctity of motherhood. With beguiling inconsistency, one religious authority praised the theory of relativity as a great scientific discovery but condemned Einstein for not having credited it to the writings of a Catholic saint of the thirteenth century; while another Catholic leader, Cardinal O'Connell of Boston, hastened to proclaim to the world that there was nothing saintly about the Einstein theory, that it was "false, atheistic and immoral." But Einstein looked upon his work with a detached objectivity which led him to speak of it in the third person, and neither praise nor denunciation

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stirred his pride or his anxiety for it. He greeted his enemies with childlike surprise. He was disconcerted and abashed by the tributes of admirers, but, as Mrs. Einstein loved to repeat to friends, rather pleased at being painted as a plagiarist, a charlatan and an iconoclast.

Society, said Carlyle, is founded on hero-worship. One of the most deeply rooted human emotions is that which makes all men admire greatness. By paying homage to a truly great man, the average person feels that he is himself made higher. This hero-worship is a universal quality, which has existed in the hearts of men of all ages. By placing on a pedestal a model for all mankind, it inspires and stimulates young and old, and undoubtedly has been of incalculable value in pushing humanity along on the road to higher and more heroic accomplishments.

But as a rule hero-worship is a tribute paid only to the dead. It is seldom bestowed on the living; men are chary about placing the wreath of a hero on the brow of a contemporary. They know too much about him. Just as no valet looks on his master as a great man, so a contemporaneous world, conscious of human frailties and the caprices of fortune, is inclined to temper its eulogies.

Perhaps the most amazing feature of the Einstein legend is that when his tremendous popularity began in 1919 time had not yet had the opportunity to weave an aura of infallibility about him. He was a man of forty, with streaks of gray in the naturally wavy hair which rose like a lion's mane above his forehead. Psychologists have speculated about "mass psychology," the "lure of the unknown," the "post-war hysteria" and the "eternal interest in the cosmic mystery" as explanations for the adulation heaped upon this man. But they have left out

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one very important factor—his attractive personality. Einstein's naïve modesty, his humility and shyness, and the combination of cosmic wisdom with worldly inexperience and the heart of a child endeared him to millions who were hungry for a hero and who felt they had found in the abashed scientist an idol who was not only a great man but also a good man. And his dreamy face, which made various observers see in it a resemblance to Lloyd George, or Dante, or a Schumann or Chopin, was not the least important cause of his popularity.

For there was a living impression of greatness in Einstein's calm and serious face, in the high-arched forehead above the kindly eyes with their far-away look. Above the large, dark brown eyes, were eyebrows of unusual shape—bushy eyebrows that grew not on the upper part of the orbits of the eyes, as is usual, but above them, and accentuated the impression of quizzical, child-like wonder which the observer received from Einstein's face. At forty, his mustache, above a full, sensuous mouth, was strong, black and bushy, in the pale, pinkish white face of a scholar who has spent most of his life indoors.

Somewhat short, as many other great men, Einstein was beginning to develop a suspicion of pudginess. And while the lionlike mane gave an impression of creative greatness, his handshake did not; he had a soft, feminine touch, a somewhat flabby quality which betrayed the fact that he disliked exercise. His indifference on the latter point matched his indifference to clothes. He was oblivious of his appearance, particularly when engrossed in work. He wore whatever was comfortable and easy to get at. When he returned from a lecture tour to France and England, Mrs. Einstein discovered that he had never

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bothered to open his carefully packed trunk, contenting himself with what he had found in a valise. A loosely fitting pair of trousers and a sweater were his favorite dress at home.

Einstein's complete indifference to finery or ceremonial garb sometimes caused him to put in an appearance at a formal function in an attire which contrasted strangely with the dress of everyone else. Such a situation would have embarrassed a more worldly person, but Einstein was not even conscious of a difference in dress, of the fact that he was violating social traditions. He paid as little attention to the dress of others as he did to his own. What difference did it make how one dressed himself? Did clothes make him any better, or worse, as a human being? The professor snorted at his wife's remonstrances and liked to quote from Spinoza: "It would be a bad situation if the bag were better than the meat that's in it." Not infrequently he appeared in high society in a business suit. Invited to address a particularly distinguished scientific gathering at Oslo under rigidly formal circumstances, his friends discovered at the last moment that he did not even own a full-dress suit. Consternation reigned everywhere except in the heart of the guest of honor. Einstein just laughed merrily. He pulled out his somewhat shabby dinner jacket, brushed it and put it on with the words: "If anyone thinks I'm not dressed elegantly enough, I'll put a tag on this coat for his benefit with the notice that it has just been brushed!"

Einstein frequently left his home for a lecture at the University clad in sandals and a pair of sport knickers. He seldom wore a hat. As he strode along the crowded Unter den Linden on his way to the lecture hall, a pipe

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in the corner of his mouth and his luxuriant hair blowing in the breeze, everyone turned to watch him in wonder. An elemental greatness radiated from Einstein which no clothes could hide. But sometimes, after considerable pleading, Mrs. Einstein succeeded in persuading him to discard his informal house slippers and his sweater and to don formal afternoon attire for a tea. Then the master savant of the age was a striking and patrician figure, a handsome sage whom any hostess in Berlin would have been proud to have in her home.

It was next to impossible, however, to drag Einstein to the ceremonies of high society. He considered them ridiculous. To him, wealth and claims of social superiority were simply expressions of arrogance and conceit. To a man of his simple tastes and humane instincts, any exhibition of elegance and wasteful luxury in a world in which many of his fellow men were suffering for want of bread, was utterly distasteful. Although he had achieved renown, Einstein remained the same simple human being, lacking in any ambition for success and riches, that he had been in his early days as a lecturer in the University at Zurich. And just as his country-club-minded colleagues at Zurich resented these humble qualities which they could not understand, so many a social leader in Berlin felt offended when her advances were coldly received by the celebrated savant. For, like all great men, Einstein was sincere and frank almost to the point of brutality. Inveigled, as he sometimes was, to a function which had been described to him as "a snack of supper for a few intimate friends" but which he discovered, upon arrival, to be a princely assemblage of the wealthy and socially prominent, he would turn his back and walk out of the

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place, never to return. The spectacle of men and women with no real claim to distinction other than what he deemed the false claim of riches, was too painful to endure.

So it was no surprise to his friends that Einstein, when he received in 1921 the Nobel Prize for Physics, the highest honor in the power of international science to bestow, turned over the nearly \$50,000 of prize money to charity without keeping a penny for himself. Academic honors from the four corners of the globe, prizes and gold medals and university degrees from the world's most distinguished institutions of learning were placed at his feet. When the Royal Society of England, which had sponsored the famous eclipse expedition of 1919, gave him its greatest honor, the Copley medal, Einstein replied with characteristic humility:

"The man who has discovered an idea which allows us to penetrate, to whatever slight degree, a little more deeply the eternal mystery of Nature, has been allotted a great share of grace. If, in addition, he experiences the best help, sympathy and recognition of his time, he attains almost more happiness than one man can bear."

When he arrived one day at Brussels on a visit to the Belgian queen, the thought that there might be a welcoming party awaiting him at the station had not entered his head, and so he failed to notice the shining limousine and the group of smartly uniformed dignitaries waiting for him. Lugging a suitcase in one hand and his violin in the other, he proceeded to walk to the castle of his hostess. The welcoming party fumed and fretted as no sign of the distinguished scientist could be found. Then they returned to the castle and informed the Queen that

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Einstein must have changed his mind about coming. Just then the frowning Queen noticed a dusty figure ambling up the road, whistling cheerfully. In her mood of intense displeasure, a tramp was the last thing she wanted to see and she turned to give peremptory orders to whisk him from the estate.

But, wait! The figure of the "tramp" had come closer now, and her Majesty's frown turned to consternation, then pleased surprise, as, calling up all her reserves of self-command she managed to stammer:

"Why, Herr Doktor Einstein! How do you do! I am so happy to see you, but why didn't you use the car I sent for you? Why did you walk all that distance?"

"Why, your Majesty, I didn't think about a car being sent for me," replied the visitor with a naïve smile. "When I got off the train, I just came out. And it was a very pleasant walk!"

Einstein could have become a very rich man in a short time if he had been willing to capitalize his fame on the lecture platform and in the newspapers. But to him an inexpensive glass dish was as good as one of silver, so why become excited about money? He believed that wealth only appealed to selfishness and always tempted its owners to abuse it. To friends who remonstrated, pointing out the good that money could do, the scientist cut in: "I am absolutely convinced that no wealth in the world can help humanity forward. The example of great and fine personalities is the only thing that can lead us to fine ideas and noble deeds. Can you imagine Moses, Jesus or Gandhi armed with the money-bags of Carnegie?"

Only one thing Einstein wanted from the world, and this, apparently, money could not buy—privacy and se-

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clusion for a life of quiet contemplation. Probably no man was so plagued by offers of gold for newspaper articles, for public appearances, for testimonials of every imaginable article from toothpaste and shaving soap to pimple eradicators and cigars. He considered all such overtures as "corruption," and rejected them with cold disdain. To Einstein money had no lure—it was simply something to give away. At one time he was supporting 150 families in Berlin. A German journal proposed to him to reprint one of his important lectures, offering him 1000 marks for the privilege. The scientist refused. The editor persisted. It was Einstein's duty to science to permit publication, he was told, and he finally capitulated. But his consent was given on one condition. He could not, he said, accept 1000 marks for the paper. That was far beyond the true worth of the address. He would permit its publication only if the editor agreed to reduce his price to 600 marks!

The success of the German editor encouraged an American publication to approach Einstein with an offer of a fabulous sum for an article dealing with any subject he cared to discuss. The offer reduced the scientist to the point of tears. He had been insulted, he told his wife.

"Does the impudent fellow think I am a movie star, or a prize fighter?" he cried.

Einstein never wrote the article. He never even bothered to acknowledge receipt of the offer. He was a scientist, a pure and honest scientist, and woe unto him who "insulted" him by treating him otherwise!

The professor never rode in a taxi, because he felt that a taxi would set him apart from the great majority of his fellow men who had to ride in street cars. When travel-

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ing, he preferred to ride third-class, and it was only after considerable persuasion by Mrs. Einstein, who always exercised a great deal of influence in worldly matters over her husband, that he agreed to compromise by riding in second-class conveyances.

It was Mrs. Einstein, an old-fashioned, modest woman, unaffected by her husband's fame, who shielded the professor from many of the annoyances of everyday life. She had charge of the family budget and she cared for the voluminous mail. With all his wizardry at mathematics, the professor could never make his bank book balance. It was she who kept the family finances straight, just as it was she who attended to the more domestic household duties. At eight o'clock each morning, as sunlight streamed into their top-floor apartment, she would turn on the water in the bathtub and call her husband. He appeared in slippers and a colorful bathrobe, played at the piano while the tub was filling, and when his wife called "Ready, Albert," crossed over to the bathroom. His wife always had to follow him to close the bathroom door—a little chore which the professor could not remember to do for himself. After a simple breakfast, he retired to his den while she sat down to sort her husband's mail according to language classifications: French, German, Spanish, Italian, Jewish, English, and so on. The mail came from all parts of the world, in all languages and in all varieties of handwriting. Some days there were several hundred letters from points as far apart as New York, Tokyo, Madrid, Moscow, Paris, London and Bombay. Mrs. Einstein went over them all, and classified them. Some she could throw away without a reply, some had to be answered immediately, others the Professor himself had to

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consider, while still others had to be translated or read to him.

The task of handling this correspondence required a good part of the day, and frequently the evening, too, had to be devoted by both to their mail. But Mrs. Einstein was an intelligent woman who understood that her husband, working under the strain of continued intellectual activity, required a counterpoise of fellowship and music and social fun. Friends dropped in during the evening to play musical instruments with the Herr Professor, while Mrs. Einstein bustled about smilingly to make her guests comfortable. There were visitors, too, from abroad who wished to confer with the scientist, and distinguished men and women who shared Einstein's intellectual and humanitarian interests.

Such companionship pleased the scientist greatly. He liked particularly to discuss philosophy—the teachings of Plato, Hume, Spinoza and Schopenhauer—with other intelligent men. He liked to read and discuss the writings of Tolstoy and Dostoyevsky and the skeptical works of George Bernard Shaw and Anatole France. Shaw once said that the best criticism about his *Joan of Arc* was a letter from Einstein. Gerhart Hauptmann, whose poetry Einstein regarded as the most profoundly moving of our time, became a close friend and was a frequent visitor in the scientist's home. The drama and concerts of classical music appealed to Einstein, and his wife had less trouble in coaxing him out for an evening of Bach or Mozart or Beethoven than for any other purpose. There were lighter moments, too, when intimate friends and relatives and their children dropped in for a visit. During such times, Einstein loved to play the rôle of the paternal uncle for

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the benefit of the youngsters in the party. Puffing away contentedly at his briar pipe, he would indulge in a Socratic dialogue with one of his nephews.

"I got a letter from an inventor in America this morning," he would say, "suggesting that an aviator go up above the clouds in a helicopter and wait for Europe to roll around in the natural course of the earth's revolution. He thinks he could get to Paris that way without crossing the ocean. Do you think that's a bright idea?"

"No, Herr Professor, I do not."

"But why don't you think it's a good idea?"

"Well . . . because . . . well, the helicopter is too heavy. It could not get beyond the air which it needs to support it, and . . . well . . ." (now the youngster espied a smile on the scientist's face and moved ahead more confidently) "well, of course the air is going round with the earth, too, so the man in the machine would get nowhere!"

"A very good answer," beamed Einstein. "You're a bright young man!" Then he got up and clapped the boy jovially on the shoulder, and, hand in hand, the two retired to the kitchen in complete understanding to hunt for some delicacy for the boy, and, not infrequently, for the scientist too.

Over this peaceful household a small cloud began to take form shortly after the close of the World War. That this cloud would grow and spread until it engulfed all Germany, and would bring to Einstein the great tragedy of his life, never entered the head of the unsophisticated professor or that of his somewhat more worldly wife. But post-war Germany, with its dispirited population too deeply saddened by defeat and impoverishment to assume

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rational attitudes, offered a golden opportunity for unscrupulous demagogues who were not above fishing for their own selfish purposes in troubled waters.

A nation which had been taught to feed its national vanity upon the alleged infallibility of its armed forces found itself in the throes of mental and spiritual, as well as material, destruction as the Armistice was declared. The Peace Conference dragged on to the fateful day of June 28, 1919, when two somber, frock-coated men waiting among the smiling roses of Versailles were called into the great Hall of Mirrors. There was about them none of that haughty arrogance with which Bismarck and his gaily uniformed lieutenants had admired their reflections in the tall mirrors of the same historic chamber. For the two quiet Germans entered not as conquerors, but as representatives of the conquered, and took obscure seats between Japan and Uruguay. When a Bolivian delegate walked up to the silent Germans and requested their autographs, he did so, not out of respect, but in the spirit of the enthusiastic and incurable souvenir hunter. And when finally the aged Clemenceau triumphantly waved his gloved hand toward the peace treaty which lay spread on the table, the men from Berlin had no choice but to rise and affix their signatures to a document which had been drafted with little concern for the welfare of Germans. Germans had brought on the frightful destruction of the war, and now they could pay for it! This was not a spirit calculated to inspire friendship and international understanding, and when the two quiet Germans returned sadly to Berlin it was to find a country whose nationalistic pride and racial prejudices were stirring with a new fever born of outraged vanity. A nation in this

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mood was ready to snatch at any philosophy which tended to drug its shattered nerves and encouraged its self-esteem. Germany's half-hearted experiment with democracy did not seem to work well, and as impoverishment and hunger and inflation took their toll, Germans in ever-increasing numbers turned toward an unreasoning faith in force and hatred as a way out of their troubles. And since they needed a scapegoat for their troubles, they turned upon the Jews, who were conveniently small in numbers and unarmed and therefore not likely to offer serious resistance to persecution.

This rebirth of the evil phases of the nationalistic and racial prejudices of Germany gradually sent the intellect of a growing portion of her people into a drugged sleep. The old beliefs of Pan-Germanism were revived, the pulse of German patriotism began to throb with a new violence, and discouraged men and women turned an attentive ear to demagogues who preached the fantastic doctrine that Germany had not started the war and had lost it only because of the base activities of traitors. And since a traitor was defined as one who could not prove himself of pure German racial stock, this automatically made all Jews traitors and therefore enemies of the Reich.

The Jews were to blame for everything. They were responsible for the war, for Germany's defeat, for the inflation of the currency, for the shortage of food, and for all the misfortunes under which the German nation was suffering. The shrinking rationalism of the terrorized German mind blamed the Jew with equal fervor for the persistence of German capitalism and the triumph of capitalism's greatest enemy, Bolshevism.

These embers of anti-Semitism might have died away

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had there not come upon the troubled German scene an egomaniac who hated democracy and the Jews with an implacable hatred such as has possessed the souls of few men. The close of the war found Corporal Hitler in a German hospital, temporarily blinded by a gas attack. He wept bitterly when he heard the news of Germany's surrender, and when he emerged from the hospital in the summer of 1919, with his sight restored but with a slight twitching of the eyelids as a permanent token of his injury, he was heart and soul for everything German and fanatically opposed to everything Semitic. The spectacle of Einstein, a German Jew, succeeding where his beloved generals had failed in spreading the fame of the German nation, was especially galling to Hitler, and he plunged happily into the work of spreading his creed of anti-Semitism and the need of armed resurrection of the old Germany.

He attacked the Versailles Treaty, democracy, particularly the democracy of the German Republic, pacificism and the Jews with equal abandon and passion, and his sinister doctrines became in 1920 the foundation for the National Socialist Labor Party. This group, which became known as the Nazis, had little more than a nuisance value during the early years of the German Republic, and no one, except Hitler himself, dreamed that the leader of the brown-shirted corps was to become, thirteen years later, head of a Nazi monarchy with far greater tyrannical power over the destinies of millions of human beings than the Kaiser had wielded.

Under the lash of Hitler, anti-Semitism throughout Germany gradually took root and spread. Now the cloud over the Einstein household became blacker and larger,

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and an occasional student dared to invade the harmless professor's lecture hall with cries of "Drive the Jew out!" As Hitler and his Nazi group continued their poisonous activities, abuse of Jews took on a new malevolence. The Nazis declared that only pure Germans should have the rights of German citizenship, and their leader voiced his enmity for all Jews in this rarely equaled vitriolic attack:

"He who does not find himself vilified each morning in the Jewish press has not spent his time in useful activity, for, had this been the case, he would have been slandered, persecuted, abused and befouled by Jews. Only he who most effectively fights these deadly enemies of our racial purity, these despoilers of the integrity of the Aryan race and its culture, may enjoy the privilege of their rancor, and the attacks of their people."

Hitler and his brown-shirted fanatics, by playing upon the passions, the prejudices and the despairs of the German people, fanned the embers of anti-Semitism into an active fire of persecution. By 1923, Hitler's influence had increased to the point where 10,000 "storm troopers" had pledged their personal loyalty and devotion to him and to any enterprise in which he might choose to direct them. At last, opponents of his sinister racialism and his philosophy of force and hatred began to bestir themselves and to seek some plan which might stop the spread of the plague of anti-Semitism. And to the gentle Einstein, as the acknowledged master mind of the age, as Germany's foremost intellectual luminary, they turned eagerly for help and leadership.

Professor Einstein up to this time had played an essentially passive part in the world of politics. By inclination given to solitary meditation, and by conviction an inter-

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nationalist who placed human values above all nationalistic and racial prejudices, he had been wholly content to devote himself to scientific research. Although holding strong opinions on many current problems, he preferred to keep in the background. He was not more than superficially conscious of his blood ties to the Jewish race, but as oppression of Jews began to spread he said sorrowfully that he discovered for the first time that he was a Jew, "and I owe this discovery more to Gentiles than to Jews." With his sudden discovery of Judaism, Einstein became an active protagonist of the ideals of his race and proudly proclaimed that "the pursuit of knowledge for its own sake, an almost fanatical love of justice and the desire for personal independence are the features of the Jewish tradition which make me thank my stars that I belong to it." He became imbued with the spirit of Disraeli, who replied to an attack by Daniel O'Connell in Parliament: "Yes, I am a Jew, and when the ancestors of the right honourable gentleman were brutal savages in an unknown island, mine were priests in the temple of Solomon." Einstein warned that those "who are raging against the ideals of reason and individual liberty and are trying to establish a spiritless state-slavery by brute force rightly see in us their irreconcilable foes." He reminded the world that the Jews in Germany amounted, in numbers, to no more than the population of a moderate-sized town, and that though few in numbers they had earned the respect of anyone who retained "a shred of sound judgment" by their patriotism and their contributions to the culture and welfare of Germany. "In these days of the persecution of the German Jews," he added, "it is time to remind the western world that it owes to the Jewish

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people its religion and therewith its most valuable moral ideals, and, to a large extent, the resurrection of the world of Greek thought."

To critics who accused the Jews of being nationalistic, a race apart, Einstein replied that there was something in the accusation but pointed out that "a communal purpose without which we can neither live nor die in this hostile world can always be called by that ugly name."

"If we did not have to live among intolerant, narrow-minded and violent people," he said pointedly, "I should be the first to throw over all nationalism in favor of universal humanity."

So Einstein, who by his own confession had never wholeheartedly belonged to country or state, or even to his own family, to whom science and platonic seclusion were the twin gods of existence, was inevitably drawn into the whirlpool of political turmoil. This shy, sensitive academician was induced by the urgent appeals of Jewish leaders, who visited him not only from his own native land but also from Paris, London and New York, to give up his passive rôle and to become, contrary to his own inclinations and to his natural love for a life of solitary contemplation, a gladiator in the arena of public strife and contemporary history. Always responsive to an appeal for help, he felt that it was his duty to give himself to the humanitarian cause of alleviating the lot of the Jews in Germany and to protect them as much as possible from the persecutions of Hitler and the reactionaries who sought to make the Jews the scapegoats for the downfall of the monarchy and the German military machine.

The peace-loving Einstein, who was anything but a politician, plunged into the restless sea of post-war poli-

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tics, a dogged will overcoming his natural timidity. He wrote voluminously, made frequent appearances on the lecture platform, and tirelessly attended conferences and meetings to plan protective measures for German Jewry. One of his first acts was to attend a gathering of the foremost Jewish intellectuals of Berlin late in 1919, in a back room of a Berlin restaurant, to formulate plans for a general Jewish congress which was to create a parliament to consider the burning issues of the Jews. He listened silently and attentively, particularly to those who advocated the principles of Zionism, and went away feeling for the first time his oneness with the Jewish race. To colleagues who remonstrated on the ground that science would suffer from the sacrifice he was making in behalf of Judaism, he replied with a far-away look in his dreamy eyes: "Can I do anything else? I have no choice. If I am in a position to help, *I must* help." Einstein, who up to this time had looked upon himself as a European closely identified with German culture, became more and more closely associated with Judaism as he saw the brutal effects of narrow-minded nationalism and the unbridled tyranny of those who preached force and hatred. In post-war Germany's anti-Semitism he saw ruin and destruction, a threat to European culture and a horrible mockery of the essence of humanity; and he determined to do his utmost to curb this heedless violence, even though this determination might, as so many anti-Semites warned him it would do, cost him his life.

That these were not vain threats was brought home to him with a stunning blow. A common interest in the welfare of the Jews had made Einstein and Dr. Walter Rathenau, a German Jew who was one of Germany's great

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capitalists by birth and who during the war period had been a key figure as head of the War Materials Board, good friends. Rathenau's experience during the war, when he had complete control over all raw materials, including foodstuffs, had won him the title of "wizard of the empire," for he had "kept the people shooting and the army eating." He was one of the great men of Germany, and one of the most ardent supporters of the infant Republic. Though far apart in their background and their daily activities, Einstein and Rathenau developed a warm admiration for each other. Although the son of one of Germany's richest magnates, Rathenau was a highly intellectual man whose sympathies for freedom and independence and greater social justice were very much like those of the scientist. Both were opposed to all the special privileges of a feudal aristocracy. Both were inclined toward the socialistic philosophy, and Rathenau maintained that "the equalization of property and income is prescribed both by ethics and by economics." Rathenau's belief that there should be a restriction in the right of inheritance of wealth, and that this restriction, in conjunction with a higher level of popular education, would "throw down the barriers which now separate the economic classes of society, and put an end to the hereditary enslavement of the lower classes," evoked a ready response in the heart of the democratic Einstein.

Einstein introduced Rathenau to Chaim Weizmann, head of the world Zionist movement, in his home, and this meeting resulted in a closer cooperation between Einstein and Rathenau and the movement to fight anti-Semitism. These activities, however, earned for both the scientist and the industrial magnate a prominent position

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on the blacklist of the Hitlerites. The threatening letters warning them of murder increased in number.

When the position of Foreign Minister in Chancellor Wirth's liberal government was offered to Dr. Rathenau early in 1922, Einstein advised his friend against acceptance. In view of the increasing anti-Semitism throughout Germany, he felt that the natural attitude of the Jews in public life should be that of a "proud reserve." Rathenau, however, believed that it was his patriotic duty to take over the Cabinet portfolio, so almost overnight he became the leading figure in the German Government, and the man more closely identified than any other with the rehabilitation of his country. His appointment was a serious setback to the royalists and to the frenzied Hitlerites, who gnashed their teeth and plotted the new minister's death. Under the expert guidance of the idealistic Rathenau, Germany's foreign relations took a sharp turn for the better. Within a few months a new treaty had been arranged with Soviet Russia and Germany's relations with the rest of Europe were taking on a friendly hue which held out the hope that the worst of the post-war economic troubles might be solved by international negotiation. Then came the tragic day of June 24.

After a quick breakfast on that fateful morning, Dr. Rathenau emerged from his suburban home in Grönewald and entered his automobile with an urgent request to his chauffeur to hurry to the Foreign Office. Important ambassadors from Paris and London were expected, and the minister was hopeful that these conferences might further his efforts to bring back a measure of prosperity and security to his beloved Germany. But this earnest idealist, like his friend Einstein, had paid too little heed

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to his enemies. June 24 marked Midsummer Day, or the Feast of St. John the Baptist, and plotters had boldly proclaimed that it would be the day for a "St. Bartholomew Feast," in which persons whose names were entered on the special blacklist were to have short shrift.

Shortly after leaving his Grünewald home, the preoccupied Foreign Minister noticed a strange automobile with three men approach. There was a hail of bullets and hand grenades. Eight bullets entered his body, one of them piercing the throat and passing to the brain. Any one of them could have proved fatal. The car, too, was demolished. Satisfied with their thorough job, the murderers sped away before any of the horror-stricken witnesses could move.

His friend's assassination stunned Professor Einstein. He had lost a beloved colleague. "For Rathenau I felt and still feel respect and gratitude for the fact that he gave me hope and consolation in the present gloomy condition of Europe and that he bestowed upon me the unforgettable hours of a man of clear sight and warm emotions," the shocked scientist said in his eulogy of his departed friend. "It is not hard to be an idealist when one dwells in Cloud-Cuckoo-Land; but he was an idealist, although he dwelt on earth and knew its odor as did hardly anybody else. I would never have thought that hatred, blindness and ingratitude could go to such extremes. But I should like to say to those who have guided the ethical training of the German people in the last fifty years: by their fruits ye shall know them." But Einstein, too, was on that black-list of the fanatical and murderous anti-Semites, and his family and friends feared that he might be the next one marked for extermination.

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So they hurried him off to friendly Holland until sanity and order might be restored in Berlin.

The plague of hatred and discontent within Germany caused some of the foremost universities and scientific institutions in other lands to approach Einstein with offers which would have permitted him to live and work in peace and under highly flattering material advantages. But Einstein rejected them all. Material affluence had no appeal for him, and he was optimistic enough to believe that his native land, once it recovered from its post-war ruin and impoverishment, would return to its moral and cultural traditions. The Professor believed that with the right kind of leaders, Germany could bring about a solution of the thorny problems which were harassing her and the rest of Europe. He discussed German reconstruction with Chancellor Gustav Stresemann, whose vigorous peace policy led eventually to the signing of the Locarno Pact and Germany's entry into the League of Nations. Stresemann's unflagging efforts for a European reconciliation based on a policy of peace—which won him the Nobel Prize—were in line with Einstein's own convictions, and the two men, one a practical politician versed in everyday affairs and the other a dreamy scientist who held aloof from the turmoil of life, widely apart in temperament but strongly united by the bond of a love for peace, became staunch friends.

Meanwhile, Professor Einstein had the opportunity to further the cause of European peace and reconciliation by his own direct efforts, and he was quick to take advantage of it. He was the first German to attain world renown after the World War, and although his German citizenship was abhorrent to the Allies, his fame had become so

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vast that even London and Paris rushed to honor and to welcome him. Einstein thus became a European ambassador without portfolio, an extraordinary envoy to all European capitals, who was not only an Olympian interpreter of modern science but also the spokesman for the advocates of the elimination of violence from the lives of men. His decision to lecture in London and Paris had one curious result: it aroused the intensely nationalistic groups on both sides. Germans wrote to Einstein and told him that no patriotic German should enter a country whose troops still occupied German soil. The strongly nationalistic camps in London and Paris were no less caustic about this "invasion" by a representative of the hated Huns, and referred to Einstein, not as a German savant, but as a Swiss Jew!

But that remarkable personal quality about Professor Einstein, that gentle charm compounded of the child and the mental colossus, once again stood him in good stead. Unlike the ambassador who was described as "an honest man sent to lie and intrigue abroad for the benefit of his country," he captivated his audiences by his obvious sincerity, by his unaffected and guileless humanity, and by those intangible yet unmistakable signs of greatness which radiated from him and convinced even his most partisan enemies that his reputation for heroic achievement was based on a solid foundation.

When Einstein rose to give the first of his King's College lectures, he could feel the cool reserve of his audience. The chairman and his host, Lord Haldane, a man of great wealth who was also one of the foremost philosophers and men of learning in England, had said, "You see here before you the Newton of the twentieth century,"

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and while the English men and women in that hall were ready to yield the respect due to a genius, they were not forgetting that the speaker was a German. Lord Haldane, in his introduction, had skilfully skipped over the point of Einstein's nationality; but there was at first no applause, there was something like a light tremor in the air, as Einstein, calm, dreamy, yet obviously suffering from the embarrassment of one who has gallantly assumed an unaccustomed and painful task, began his address to this gathering which meant to be respectful, but also was determined to be unfriendly. And Einstein, who in his aggression on the profound mysteries of the cosmos had shown a greater courage than that of a Napoleon or a Lindbergh, was momentarily frightened and thought with longing of the comfort and protection of his secluded study. But he was full of his subject, and his fears were forgotten as he began to speak of the high mission of science, the internationalism of the world of art and music and intellectual achievement, and the need for co-operation to build a better and happier world.

The hostility of his audience began to melt away as Einstein gracefully paid tribute to the English race for having produced the most important fundamental ideas of science, and the greatest of all scientists, the Englishman Newton whose work "certainly marks the greatest step ever taken in linking up natural phenomena causally." The brilliant genius of Newton had determined the course of western thought, research and practice "to an extent that nobody before or since his time can touch." Newton deserved "the deepest reverence" not only of his fellow Englishmen but of the whole world; and, added Einstein modestly, "Let no one suppose that the mighty

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work of Newton can really be superseded by the theory of relativity or by any other theory—his great and lucid ideas will retain their unique significance for all time as the foundation of our whole modern conceptual structure in the sphere of natural philosophy.”

Einstein told England, too, of his gratitude to English scientists of the present day who had bridged “the lamentable breakdown of the old active intercourse between men of learning” and had lived up to the common ideals of all scientists by sending out expeditions to test the theory of an enemy German. Petty nationalism had destroyed dispassionate scientific investigation on an international scale in most parts of the world, but it had remained for England, he pointed out, to express once again the kinship of all science and learning—a solidarity so strong that scientists, he believed, would always find each other in spite of political and commercial disturbances.

It was thoroughly in keeping with the traditions of English culture, said Einstein, that “eminent scientists should have spent much time and trouble, and your scientific institutions have spared no expense, to test the implications of a theory which was perfected and published during the war in the land of your enemies.” It was true that the study of the influence of the gravitational field of the sun on light rays which the expeditions at Principe and Sobral carried out was a purely objective matter, but Einstein could not “forbear” he said, “to express my personal thanks to my English colleagues for their work; for without it I could hardly have lived to see the most important implication of my theory tested.”

The unpretentious greatness of the mind and spirit of

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the speaker made a profound impression upon the originally hostile audience, and the enthusiastic approbation which Einstein received at the conclusion of his lecture was described by somewhat awe-struck editorial writers the next day as "a great reception." Einstein's feat was called a "turning-point in the emotions of post-war England" which demonstrated that fundamentally "science and the arts have no boundaries and cannot be nationalized." England's appreciation of genius, even if that genius was rooted in German soil, was "a symptom of returning health," said the editor of one of London's foremost journals, who hoped that the "avidity" with which Einstein had been heard and the enthusiasm which his lecture had evoked indicated that "we may now justifiably hope for the gradual restoration of the sane conditions of pre-war times."

"The position of scholars, English as well as German, was not irreproachable during the war, but this welcome [of Einstein] shows that genius is no longer denied admiration, for the admiration of genius is rooted as deeply in human nature as the desire to injure the enemy," ran the editorial comment. "Our outlook on life, our ability to distinguish the noble from the bad, has been crippled and shamed long enough by the passions of war. It seems sanity, understanding, and harmony are being restored by men of creative genius."

This faith in an international fellowship of the intellect which went beyond selfish nationalism and excluded the pettiness and savage emotions of super-patriots echoed the sentiments of Einstein, who was firmly convinced that the cooperation of men of like mind in Europe would succeed in building "a bridge of mutual trust between

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the nations" and in spreading the ideal of human love uninfluenced by hatreds and selfish desires. Although the modest professor from Berlin would have been the last person to admit it, he himself had given a heroic display of courage in capturing the hearts of his audience. For he had demonstrated once again that the highest expression of the heroic quality comes not in the capture of a fortified battle ground but in the conquest of the human spirit.

His courage suddenly began to weaken, however, when he arrived at Cloan Manor, the luxurious home of Lord Haldane in the Thomas Hardy country. It was late in the evening when the Professor and Frau Einstein reached the pretentious home of their host, and a liveried butler with a flame in a silver candlestick showed them to a chamber nearly as large as their whole apartment in Berlin. Einstein, who had brought hardly more than a toothbrush with him for his English visit, felt abashed by so much wealth and luxury, but this feeling turned to actual fright when the attendant courteously informed the distinguished guest that he was to be the visitor's "personal servant" during his stay!

As soon as the uniformed butler was out of earshot, the Professor turned with dismay to his wife: "Elsa, this is preposterous; do you think they would miss us if we sneaked out of here?" His wife assured him that they would "miss" him, so the two went to sleep in the lavish bedroom which violated all of Einstein's instincts of ascetic simplicity. In the morning, the Professor, always an early riser, was tussling vainly with the heavy window curtains to let in the morning sunlight when a quietly amused voice from the bed suggested:

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"Albert, why don't you ring for the butler and let him do that?"

"No! No! Please don't, Elsa. He is too formidable!"

And the struggle with the curtains went on with a renewed, almost a frenzied, vigor. But the man who had successfully conquered the most difficult mathematical puzzles was unequal to this task. Professor and Frau Einstein sat for a while in the obligatory twilight, then in a mild voice she suggested once again: "Better call him, Albert. Some tea would be nice."

But one Englishman dressed up in a butler's uniform still represented a far more "formidable" obstacle than a thousand of his countrymen in a lecture hall, and the frightened Einstein pleaded: "Please, Elsa, let's not. Maybe they'll forget us here."

Then it was that Mrs. Einstein got up, giving up her hopes for what was to her the rare treat of breakfast in bed. Within a few minutes the curtains were conquered, and the guests were dressed and on their way to the dining room for their morning meal.

Einstein made his first visit to Paris after the close of the World War to receive an honorary degree from the University of Paris. During this and subsequent lecture trips to the French capital, he discovered that to stimulate the French to resume their great humanitarian and cultural leadership in Europe and to push them toward a rapprochement with their war-time enemies was a far more formidable task than that of overcoming the cool reserve of the English. The visitor to Paris during the early 1920's found it difficult to believe that here was the gay, sprightly land of mirth and social ease which had drawn the rest of the world like a magnet throughout

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the centuries. The horror and destruction of the war still lay, an oppressive pall, over the minds and spirits of the French, who, although noted as the greatest individualists in the world, were now united in their common hatred of Germany. It was a period during which it was still dangerous to speak German on the streets in France, and the Paris newspapers, conscious of their readers' sensibilities, took pains to describe Einstein not as a German but as a Swiss.

"Here," commented Einstein, "is yet another application of the principle of relativity for the delectation of intelligent persons. Today I am described in Germany as a 'German savant,' and in England and France as a 'Swiss Jew.' Should it ever be my fate to be represented as a *bête noire*, I should, on the contrary, become a 'Swiss Jew' for the Germans and a 'German savant' for the French!"

Einstein's genius and charm, however, succeeded in winning French approval and in pushing political and nationalistic issues into the background. In his teachings of peace and humanity and mutual helpfulness, the French found much that coincided with the feelings which they had so nobly expressed in that famous watchword of the French Revolution—said to have been suggested to them by Benjamin Franklin—and which today confronts visitors from almost every public building in France: *Liberty, Equality, Fraternity*. They lent an attentive ear while Einstein explained that war and destruction marked a betrayal of the human spirit, that the French should become restorers and guardians of mankind's conscience, and that spiritual as well as military disarmament was needed if France and Germany were to live side by

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side as peaceful neighbors. He acknowledged—and thereby won French gratitude—that mutual trust and co-operation between France and Germany could come about only if the French demand for security against attack were satisfied, and suggested that it might be satisfied by an international court of arbitration superior to any state and empowered to proceed with economic and military force, in concert with the other members of the League of Nations, against any nation that broke the peace or resisted an international decision made in the interests of world peace. Such a court of arbitration, he said, would give nations courage to disarm seriously.

“We owe our principal advantage over the beasts to the fact that we live in a human society,” Einstein pointed out. “The individual, if left alone from birth, would remain primitive and beastlike in his thoughts and feelings to a degree that we can hardly conceive. The individual is what he is, and has the significance that he has, not so much in the virtue of his individuality, but rather as a member of a great human society which directs his material and spiritual existence from the cradle to the grave. A man’s value to the community depends primarily on how far his feelings, thoughts and actions are directed toward promoting the good of his fellows.”

Einstein urged that the political organization of Europe be strengthened, and an attempt be made toward the gradual abolition of tariff barriers. The people of Europe should be awakened to a sense of solidarity which did not stop at frontiers, he said, and France ought to lead the way in overcoming the bonds of fevered nationalism and in promoting reconciliation, joy in life, and love toward all living creatures. This recluse who craved dialogue with

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the stars but who had been forced into the rôle of publicist, propagandist and oracle, argued that the special interests of each country should be subordinated to the interests of the wider community of the nations of Europe, and that this new orientation would overcome the psychological obstacles standing in the way of permanent peace and prosperity. He warned—and calamitous events were to prove subsequently how right he was—that “the survival of Europe” depended on the successful issue of this change, and upon the eradication of the accumulated resentment of the war period and the improvement of human relations in general. This spiritual disarmament would make it less of “an uphill work” to effect that international cooperation which “the irresistible pressure of economic developments” made inevitable.

“The destiny of civilized humanity depends more than ever on the moral forces it is capable of generating,” Einstein went on. “Whereas formerly it was enough for a man to have freed himself to some extent from personal egotism to make him a valuable member of society, today he must also be required to overcome national and class egotism. Only if he reaches those heights can he contribute toward improving the lot of humanity.”

Einstein's visits and lectures did more than contribute toward the revival of the noble traditions of French science and culture and the fellowship of the intellect unhampered by the passions of nationalism; it had a direct and practical result which was to influence history. Aristide Briand, a genuine liberal and the man who had served as premier more often than any other politician in France, believed, with Einstein, in disarmament and the outlawry of war. The Socialist premier met the Ger-

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man scientist, and the two men discussed the necessity of Franco-German rapprochement as a prelude to European peace. Einstein was able to bring to the French leader's attention the peace views of his friend Chancellor Stresemann and to point out how closely the views of the two leaders of Germany and France coincided. There followed conferences between Stresemann and Briand looking toward European reconstruction, and in 1925 Briand, then directing the foreign policy of France, negotiated and signed with Stresemann and Sir Austen Chamberlain of England the famous Locarno Pact. That treaty, which introduced a new spirit of cooperation and compromise into the turmoil of European affairs, won world-wide acclamation and, for the three principal signatories, the Nobel Peace Prize. And no one in Europe was happier than Einstein, who saw in the treaty further evidence that international cooperation provided the way to reconcile conflicting views and to bring about that spiritual disarmament which he considered so essential to the fundamental well-being of all Europe.

The peace-loving Professor saw a further opportunity to aid the cause of European reconstruction when the League of Nations created a commission for intellectual cooperation. The leading intellectual personalities of Europe were to represent their countries on the commission, and Einstein was elected as the representative of Germany. Though dismayed by the fact that leisure to devote to his scientific researches in his own little study seemed to be getting less and less, he felt that he could not refuse a service which might aid so much in curbing the epidemic of hatreds and in restoring confidence between the nations. He took part regularly in the work of

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the commission, which held its first meetings in Geneva under the chairmanship of the philosopher and pacifist Henri Bergson. Representing Holland in the same group was Lorentz, and the two men who had been friends and colleagues for nearly twenty years entered into their new work with the same enthusiasm which they had devoted to their pioneering investigations into the mysteries of light. In 1928, the association of the two friends with the League Commission was permanently severed; in the case of Lorentz, by death, and in Einstein's instance, by a severe heart attack. Upon Einstein's resignation from the commission the general director of the Prussian State Library took his place.

Einstein's activities in political affairs won him many new friends, and, as was inevitable, some bitter enemies. One of the latter managed to get by the watchful eye of the faithful Otto, and one day Mme. Marie Erguelsewa Dickson, a Russian widow of an American who had been living in Paris since the Russian Revolution, surreptitiously entered the Einstein apartment in Berlin. Murder was in her heart and at the end of the hatpin which she brandished venomously, but she had figured without Mrs. Einstein who could rise to any emergency to protect her beloved husband. The scientist's wife disarmed the threatening visitor, and summoned the police; and did it all so competently and quietly that Professor Einstein did not learn of the danger to his life until a long time afterwards.

Although Einstein was unimpressed by his own fame—in fact considered it “an irony of fate” that he was the object of “excessive” admiration—the world at large learned to admire him more and more with the years.

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His lecture trips to European capitals, particularly London and Paris, made him one of the best-known men in Europe, an international figure who was generally recognized as the master mind and spirit of the age. A survey conducted by the London *Daily Chronicle* showed that England had lost every vestige of its former hostility and now regarded him as "the world's greatest man." He was accepted everywhere as an example of man's triumph over Nature, and as the first citizen of the world. And Einstein, though unhappy about being ballyhooed as the greatest intellectual luminary on the globe, came to realize that the noisy publicity showered upon him had one valuable result. It placed under his feet a pulpit from which he could preach against anti-Semitism and for peace and the upward development of society with greater force than any other man not holding public office. And he determined to use his new power to further the causes so close to his heart.

VI

FROM A PULPIT BUILT OF FAME

Those should be the best loved who have contributed most to the elevation of the human race and human life. But if one goes on to ask who they are, one finds oneself in no inconsiderable difficulties. In the case of political, and even of religious, leaders it is often very doubtful whether they have done more good or harm. . . . The true value of a human being is determined primarily by the measure and the sense in which he has attained to liberation from the self.

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THE forward march of civilization, the upward struggle of mankind, must find its impetus, in the last analysis, from men of great intellect and large heart. It is the sparks from their genius and their rich humanity which fire mankind to seek a higher and better world.

But within recent years the warning has come with increasing frequency that our great scientists and philosophers remain devoted to their own specialized, abstract branch of knowledge and refuse to be moved by, and to take part in, the burning problems of the day. The example of such great minds as Leibnitz, Kant and Spinoza, who, in spite of all their devotion to science and philosophy, took pains to trumpet their views on the direction in which the currents of life were moving, rarely

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inspires our foremost intellects of the present era. Oswald Spengler argued that this lack of intellectual and spiritual fortitude was one of the contributing causes of a decline in western civilization. A world passing through what is perhaps the most critical period since the Middle Ages, with nations torn by racial hatreds, economic strife, wars and fanatic nationalism run wild, has good reason to deplore that most of the great heads of the twentieth century unfortunately come without a union with a great heart.

The outstanding exception to this cultural trend has been, fortunately for the betterment of human society, also the greatest mind of the age. Actuated by a quick sympathy for human suffering in any form and by a self-sacrificing idealism, Professor Einstein has turned the searchlight of his powerful intelligence upon all the essential issues of the day. Blessed with that rarest tribute of a fickle world, immortality during his own lifetime, he has managed to remain apart from the artificial splendors and the dangers of his immense popularity and to fashion to his undying renown a pulpit from which to appeal to the conscience of his fellow men. Left to his own inclinations, this shy, simple lion of the mental kingdom would have buried himself in the peace and quiet of his turret-like study in his top-floor Berlin apartment; but a world whose love, interest and admiration he had excited called on him for help. If a man is to measure up to true greatness, he must do more than possess great qualities; he must know how, and—even more important—be willing to make active use of his precious endowments. And as his modest apartment on Haberlandstrasse developed into a Mecca for those who came by foot or by post in the hope of obtaining inspiration and guidance,

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the unsophisticated Professor, with his usual unselfishness, responded generously out of an intensely human heart.

Speaking tours took him to the four corners of the globe, and repeatedly to London, Paris, and Geneva, to plead for his favorite causes, pacifism, Jewry, and worldwide disarmament. He dined with Kings and Emperors, who felt honored in feting him, as well as with kindred spirits, during visits which took him to every continent except Australia. He desired nothing from the world, least of all the mantle of an oracle. But the world at large seemed convinced that here was a great and good man who possessed all the wisdom of the seven sages; and each morning the perspiring, still somewhat bewildered, Otto trudged up four flights of stairs with the daily cargo of mail which sometimes filled three baskets. His advice was sought by peoples everywhere on problems ranging from science to metaphysics, from Judaism, the tyranny of dictatorships and the persecution of Negroes, to the relationship of gold to prosperity, old-age unemployment, and that perennial of all human interests, love. And if sometimes, as in upholding democracy in Spain's tragic civil war, in combating Japanese aggression in the Far East or in urging a more just distribution of the fruits of industry, he stepped on the toes of those who were grinding axes on the other side of the fence, he was not one to flinch from what he considered his duty.

In many ways Einstein was not a modern man, for he was wholly lacking in that selfishness, that profound interest in the pursuit of material success and superficial pleasures, which marks most men and women of our times. His genius partook more of that high idealism

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which has been called the great glory of the nineteenth century, and armed with altruism, an understanding of the weaknesses of others, and a love for all humanity, he waged war against lovelessness, against those who practised brutal oppression for their own gains, against compulsory military training, and against fascism and dictatorships. And since great ideas combined with a great personality comprise a union of tremendous force, Einstein's voice rang with a power few men not holding political office have enjoyed.

His universality embraced a wide range of interests. While scientific research always remained closest to his heart, living reality in any form evoked a sympathetic interest. He valued human personality above all else, and considered the creative, sentient individual far more precious in the pageant of human life than the political state. For human personality, he said, "alone created the noble and the sublime, while the herd as such remains dull in thought and dull in feeling." He honored George Bernard Shaw, Balzac and Spinoza as examples of that highest good which human personality may achieve. He admired Shaw as a man who was able to see the weaknesses and follies of his contemporaries and yet to remain himself untouched by them. The satirical dramatist had fascinated and educated his generation by subtle humor and grace and by holding up a mirror to it by the impersonal agency of art. The Balzacians of the world were proud when the master mind of the twentieth century told them that Balzac "perhaps as no other, casts light on the human creature; he teaches us to love his weaknesses." Einstein's tribute to Spinoza, who was one of the greatest educative and philosophic influences in his own life, upon

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the three-hundredth anniversary of that philosopher's birth, was cabled from Berlin to all the leading newspapers of the world, and millions read that the scientist saw in Spinoza's works a spur to a "higher plane of conduct" free from the "irrational reactions of blind emotion."

"To Spinoza the spiritual and the material are merely different manifestations of one universal, deterministic reality," Einstein explained. "This concept has become the intellectual heritage of all men who seek spiritual values in the field of the material. But even our age is still very far from grasping the full implications of this concept in its application to life, as Spinoza has grasped it.

"The recognition of the causal interrelationships of human behavior should lift our actions to a higher plane of conduct, which should not be subject to the irrational reactions of blind emotion. Our behavior should be motivated by the ever-present realization that human beings in their thoughts, feelings and actions are not free agents, but are as subject to the inexorable laws of cause and effect as are the stars in their courses."

Einstein, from his rostrum of fame, spoke out as the commissioned guide to mankind on such widely divergent topics as art, literature, politics, the immortal soul, religion, old-age pensions, technocracy, financial and family troubles. And his opinions showed to what an extraordinary degree this pensive scientist grasped the weaknesses and difficulties of his fellow men. He said that man comes to earth for a brief sojourn, "for what purpose he knows not, though he sometimes thinks he senses it." But, Einstein pointed out, it was not necessary to go deeper into the daily life of the human race to know that

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"it is plain that we exist for our fellow men—in the first place for those upon whose smiles and welfare all our happiness depends, and next for all those unknown to us personally but to whose destinies we are bound by the tie of sympathy." Passionately articulate through his hatred of injustice and oppression, he frequently hit out against all class distinctions, which he regarded as contrary to fair play and based on force.

A certain amount of wealth, he acknowledged, was necessary to allow the flourishing of culture and to enable a fraction of the population to work at things not directly necessary to the maintenance of life. But in the last analysis, the teaching of pure humanity, he believed, was the greatest living force, and "if one purges the Judaism of the Prophets and Christianity as Jesus Christ taught it of all subsequent additions, especially those of the priests, one is left with a teaching which is capable of curing all the social ills of humanity."

Professor Einstein was not without his lighter moments, when his attention for the nonce was turned from the more profound problems of life to the humorous expressions and the peccadillos of human existence. Occasionally he penned pretty rimes to children named in his honor. A savant of twelve years who had formulated a perpetual-motion theory, found a ready welcome when he called upon the scientist, and the two sat down for half an hour until Einstein convinced his precocious colleague that there was a flaw in his calculations. Einstein's vast fan mail, and the increase in the number of callers at his home, had made it necessary to employ a secretary, a young woman who was much harassed by men and women who wanted a "simple" explanation in a sentence

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or two of the vast complexities of the theory of relativity. She besought the author of the theory for some help.

"What," she implored, "shall I tell them is relativity?"

The face of the scientist wrinkled with a roguish smile as he removed his briar pipe from his mouth and appeared lost in meditation.

"Tell them," he told the surprised secretary, "that when a man sits with a pretty girl for an hour, it seems to him only a minute. But let him sit on a hot stove for only a minute—and it's longer than any hour! That's 'Relativity'!"

An American correspondent professed to see a relationship between gravitation and love, and wanted to know if Einstein agreed with him that the sweet sentiment was the mark of foolishness in man. Einstein's denial was contained in one cogent sentence: "Falling in love is by no means the most foolish thing mankind does—but gravitation cannot be held responsible for that." Greater success attended the efforts of an American artist who had called at the Berlin apartment to sketch the scientist. His work finished, he was escorted to the door by Professor Einstein himself. As the two men shook hands in farewell, the artist asked Einstein what he considered the best advice for success in life.

The reply came in the form of a mathematical formula:

"If A is success in life," he said, "I should say the rule for success may be expressed in the formula $A = X + Y + Z$, X being work and Y play."

"And what," the artist asked, "is Z ?"

"That is keeping your mouth shut," was the quick response.

Having shown himself willing to give his aid to human-

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itarian causes, Professor Einstein found himself in the difficult position of a demigod in whom millions placed their trust. "Einstein will befriend us, as our cause is just," became a sort of popular slogan, which his benefactions did a great deal to support. He was in demand for all causes. His signature appeared on a manifesto accusing the Yugoslav government of murdering a professor whose teachings it did not like, and on an appeal to Poland in behalf of evaders of military service. Professor Einstein was among those who protested to President Hoover against the proposed execution of the eight Scottsboro Negroes, and he was a champion of Mooney in a California cell. He was elected to honorary membership in dozens of societies, and was named an officer of pacifist organizations, a special adviser to the Himalayan Research Institute of the Roerich Museum and executive committeeman of the Ingersoll centenary celebration. A newly-planted forest was christened in his honor in Palestine. But one post Einstein flatly rejected—that of honorary vice-president of the Mark Twain Society. He refused to accept his election when he discovered that Mussolini had received a similar tribute.

Einstein opposed monarchy and was the enemy of special privileges for a feudal aristocracy. In his political views, he believed that society was moving toward a greater measure of organization and collectivism. He favored the socialistic philosophy as containing the highest idealism and the most effective proposals for removing class distinctions and for producing a more just industrial and economic order. He was described by a Berlin newspaper as "a thinking, liberal democrat," but in the tenu-

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ous days of the German Republic both the Professor and Mrs. Einstein voted the Socialist ticket.

But, being a strong individualist who prized solitude and freedom above all else, Einstein could not adopt any socialistic program which eliminated the individual and human liberty under a system of state autocracy. Thus, he argued that Lenin's methods were not practical, although he honored the Russian as a man "who completely sacrificed himself and devoted all his energy to the realization of social justice; men of his type are the guardians and the restorers of the conscience of humanity." He expressed the hope that Soviet Russia would be permitted to go along in a peaceful development of a great social experiment which was likely to have "decisive significance" for the whole world; but he could not lend his support to dictatorship in any form, for dictatorship, he was convinced, destroyed intellectual creation and intellectual growth. In a picturesque metaphor, he characterized dictatorship as a force which "introduces the muzzle and this produces stupidity," with science, the arts and literature all suffering therefrom.

Speaking to an English audience in London, where he had now become an acknowledged leader of world thought, Einstein declared that he had always been "passionately opposed" to systems of dictatorship, whether in Russia or Italy, for "force always attracts men of low morality, and I believe it to be an invariable rule that tyrants of genius are succeeded by scoundrels." True, it was necessary for the achievement of any complex undertaking that one man should do the thinking and directing and in general bear the responsibility, but "the led must not be compelled, they must be able to choose their

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leader." Any autocratic system of coercion must, sooner or later, degenerate.

"If we want to resist the powers which threaten to suppress intellectual and individual freedom we must keep clearly before us what is at stake and what we owe to that freedom which our ancestors won for us after hard struggles," he emphasized.

"Without such freedom, there would have been no Shakespeare, no Goethe, Newton, Faraday, Pasteur or Lister. There would be no comfortable houses for the mass of the people, no railways or wireless, no protection against epidemics, no cheap books, no culture, no enjoyment of art for all. There would be no machines to relieve people from the arduous labor needed for the production of the necessities of life. Most people would lead a dull life of slavery just as under the ancient despotisms of Asia. It is only men who are free who create the inventions and intellectual works which to us moderns make life worth while."

Whenever the darkness of prejudice or ignorance threatened to engulf human liberty, Professor Einstein was ready to don the robes of a Sir Galahad and march up to the mouth of the enemies' cannon. On the plea of a group of Italian scientists, he sat down and penned a vigorous protest to the Italian Minister of State against the "cruel persecution" with which men of learning were threatened in Fascist Italy. He denounced a form of oath in which fidelity to the Fascist autocracy was to be promised, and urged the Minister of State to "please advise Signor Mussolini to spare the flower of Italy's intellect this humiliation." Einstein pointed out that, no matter how greatly the political convictions of Mussolini

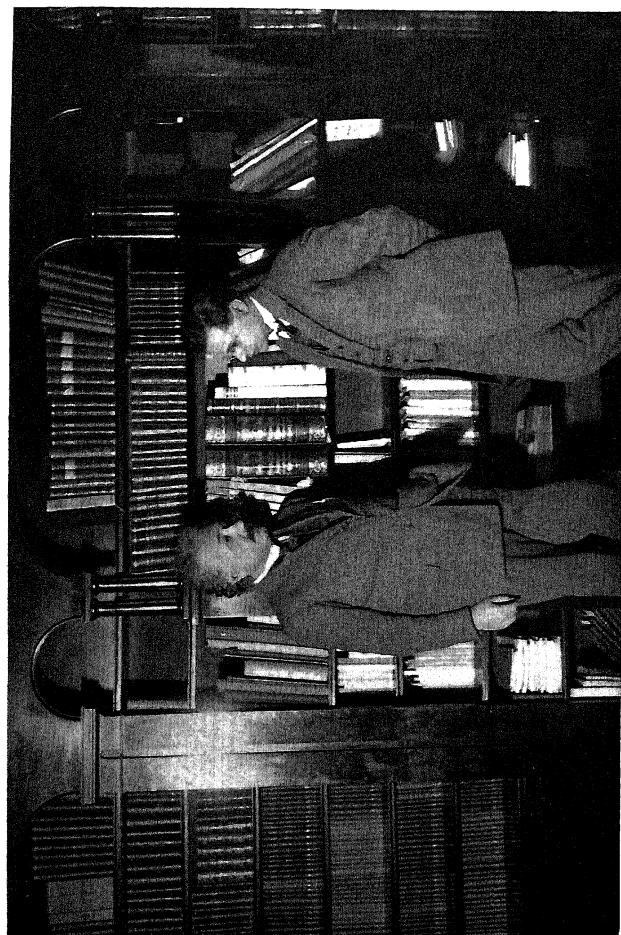
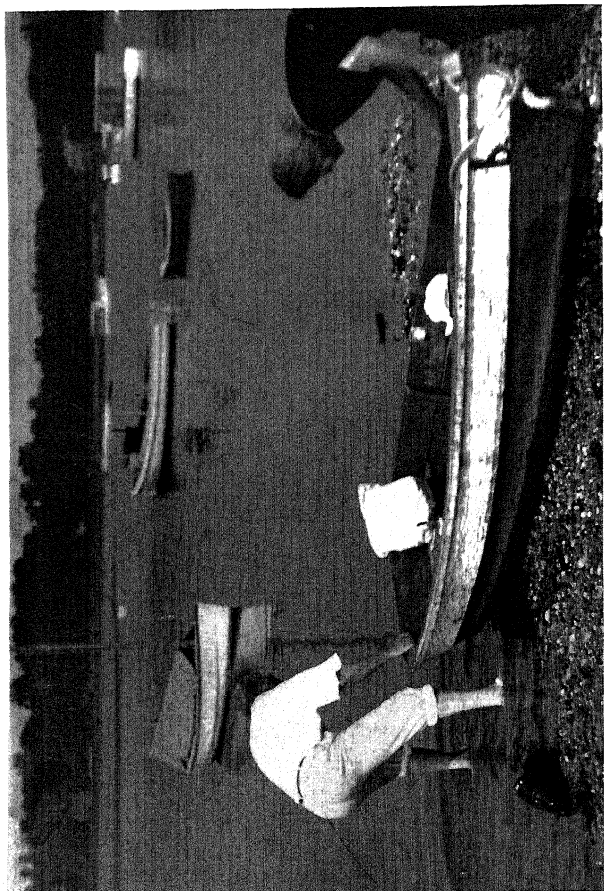


Photo by Ruth Jacobs-Edith

EINSTEIN CONFERS WITH A COLLEAGUE



THE PROFESSOR IS ABOUT TO ROW OUT TO HIS SAILBOAT, SHOWN AT THE LEFT

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might differ from those of the scientist, both esteemed the progressive achievements of the European mind and those achievements "are based on freedom of thought and of teaching, on the principle that the desire for truth must take precedence of all other desires." European civilization had celebrated its rebirth in Italy at the Renaissance on the basis of this principle, a principle to which had been sacrificed the martyr's blood of great men, "for whose sake Italy is still loved and revered today." The message closed with an appeal that the honest servants of truth be left in peace, and with the expressed hope that "my request will not fall on deaf ears." But all Mussolini could hear was the rattle of sabers; the sacrifice of Italian intellectual and humanitarian prestige meant nothing to him if he could only produce what he hoped would be an effective army of "nine million bayonets."

Einstein appealed, too, to the generous and idealistic instincts of youth to take up the cudgels to maintain the precious gifts of liberty. When Professor Gumbel of Heidelberg was threatened with expulsion for pacifist teachings, the scientist appeared before the student body and faculty to enlist their aid for Gumbel. He assailed those students who had joined in the hue and cry against the teacher as "egotistical" youth who by failing to live up to the ideals of tolerance, justice and truth, offered "one of the saddest aspects of our time." Dismissal of Professor Gumbel would be "political murder," proclaimed Einstein, who went on to point out that while academic chairs were many, the number of wise and noble teachers was few. If Germany were to rise above her misfortunes, her students, he emphasized, must develop faith in the amelioration of human society, respect for every

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honest opinion, and the tolerance for which Germany's great men of previous generations had lived and fought. The universities must become a shrine of the hopes and ideals of society, and men like Professor Gumbel instead of receiving condemnation should be honored as "apostles of justice" who were working toward that cherished goal.

The spirit and thought and feeling of Einstein made a profound impression upon millions of men and women throughout the world. Fortune or chance is chiefly responsible for making most of our heroes, but in Einstein's case his persistent greatness of mind and heart removed the last lingering doubt that here was a world hero whose fame was built on foundations as solid as Gibraltar. His growing renown made it impossible for him to resist any longer the constant pressure upon him to visit other lands, to give other peoples than those of his native Germany the opportunity to see and to hear him; and as the curtain went up on the momentous decade of the 1920's the Professor began a series of world-girdling journeys which partook largely of the nature of triumphal processions.

Upon the urgent invitation of Japan's leading scientists and men of learning, Einstein set out during the latter part of 1922 for a trip to the Far East which was to prove one of the most valuable experiences of his life. It was his first long journey from home, and the prospect of seeing strange lands and unfamiliar faces excited him. Germany's ambassador of good will to the world decided, like any excited American schoolboy making his first trip to London and Paris, to keep a diary of his travels. The diary duly reported the interesting trivialities which hold a passing fascination for all travelers. Thus, Einstein faithfully made this record on the first leg of the trip to

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Marseilles, where he and Mrs. Einstein were to board a Japanese steamer for the Far East: "Lost my wife at the border, but she was recovered immediately." He boarded the steamer with a vivid memory of a Marseilles breakfast which had included insects in the morning coffee. But all such minor irritations were forgotten as the efficient Japanese crew completed their last minute preparations, and the vessel carrying the flag of the rising sun steamed out into the sky-blue Mediterranean. Mr. and Mrs. Einstein happily explored the trim ship which was to be their home for the long journey, and the scientist, his keen mind ever active, told his diary that the fundamental trait of the diminutive Japanese appeared to be an impersonal, reserved quality which made them content in any social or economic position in which they found themselves.

Einstein found a striking contrast between this stolid attitude and the behavior of the Hindus, whose religious, racial and social traditions have combined to give them a speculative turn of mind, when the Japanese ship put in at Colombo and various Indian cities on its way to Kobe. In tropical Colombo, the great modernized seaport of Ceylon, where Eastern Asia really begins for the traveler from Europe, the Einsteins saw their first Hindu, an elderly, slender figure with delicate features and a gray beard, who brought to the scientist several cablegrams and an impassioned plea for a tip. Wherever they went in Colombo, with its picturesque Asiatic bazaars, giant rat-proof rice granaries and luxuriant cinnamon gardens, the Einsteins saw examples of the expressive physical features and subservient manner which they learned to identify with the Hindu race. To the Professor, the Hindus united an inexpressible amount of pride with

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depressing characteristics, and he chronicled the illuminating observation that they looked like "nobles changed into beggars"!

During his excursions in India, Einstein's compassion was further aroused by the seemingly endless class distinctions and the vast social differences which exist in that tremendous, teeming land of more than 300,000,000 human beings. Professor Einstein's humane nature revolted at the sight of poor men pulling other men, with the comfortable appearance of money in the bank, in rickshaws in the manner of draft animals, and he refused to become a party to such "human degradation" by riding in those vehicles. Mrs. Einstein, however, well aware of her famous husband's docile and plastic nature, gently remonstrated with him and succeeding in persuading him that the rickshaw boys had to make a living, and by denying them their patronage they would be making life harder for them. Thereafter, the scientist and his motherly wife were extensive patrons of the rickshaws as they visited the gaudy splendors of India's crowded cities, much to the delight and profit of the unfortunate human donkeys.

Traveling was making Professor Einstein wiser about the diversity of man and the great gulf which separated the peoples of the earth in their economic and social life. But this growing wisdom robbed him of some of the happiness which he was deriving from the journey. The sight of so much unhappiness and injustice everywhere saddened him. The discovery that virtue and vice, fortune and misfortune, happiness and misery, are rather equally distributed to nations, and frequently with little regard for justice, was further emphasized when the

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steamer passed through the glowing tropical colors of the island-strewn Indian Ocean to Singapore, that hot, humid island at the southern extremity of the Malay Peninsula which is one of the most cosmopolitan cities in the world. Here representatives of every Asiatic race, and most of the other nationalities on the face of the earth, were engaged in a vast industrial and commercial empire growing out of Singapore's extensive tin smelting furnaces, rubber factories, tanneries and pineapple tinning establishments. Wealthy merchants, industrial barons and land-owning potentates lived in a princely, Oriental splendor, while the streets were crowded with diseased beggars, prostitutes and thousands of human beings whose lot was little better than that of an over-worked beast of burden.

The tense drama of the human struggle for existence was presented anew in Shanghai, where more than 300,000 groaning men and women and children were ruining body and soul by long, racking hours in cotton and silk mills. In China's greatest seaport, Professor Einstein's social sympathies were aroused as never before as he saw how, even in the land which boasted the oldest contemporary civilization and the largest cultural unit in the world, industrial techniques and the greed for profit were reaching out like an octopus to pierce through age-old traditions to found an industrial empire associated with which were all the evils that accompanied the early days of the industrial revolution in England. While human society was achieving a measure of progress in some parts of the world, it was retrograding in others.

Professor Einstein wanted to wander, to explore this slow and painful enfranchisement of the human race for him-

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self, and to study at close hand that strange character of the Chinese which made them immobile, uniform and unchanging in the face of extraneous influences which had transformed the rest of the world. He was particularly fascinated by the cheerful and childlike attitude of many Chinese which led them to accept with philosophic calmness a subsistence which depended on as little as five cents a day. But in Shanghai, as in Singapore, he had little opportunity to wander where fancy might direct. For fame has its disadvantages as well as its blessings; and in each port he had to put up with the annoyances and the intrusive publicity of renown, with continual official ceremonies and public receptions at which potentates, politicians, poets and savants turned out to pay homage to the distinguished visitor. Einstein's arrival and departure from each city was made to the accompaniment of bowing reception committees, grinding cameras, speeches which he did not understand and to which he replied in German, a language equally unintelligible to most of his auditors. He and his wife were whisked through cities in fast-moving automobiles which stopped briefly at points of interest and then, perhaps after a speech or two, just as they were getting interested in the sights and people about them, whisked on to another landmark, where another ceremony was enacted. And Professor Einstein who hated all fuss and bother, and who wanted above all else to move about alone with his wife, made a virtue of necessity and submitted valorously to the honors paid him.

This ceremonial of fame, with its accompanying strain, reached its peak as the sage arrived in Kobe, the picturesque seaport set against a background of hills in

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Western Japan. Einstein, who was getting somewhat accustomed to the rôle of a demigod, was taken aback by the welcome that awaited him. Perhaps hero-worship is so strong in the heart of the Japanese because they have so little regard for human freedom. To them, Einstein's visit was sufficient reason for a national holiday. The celebrated scientist from Berlin landed to the accompaniment of thunders of applause, and the Emperor and Empress unbent to pay honor to the sovereign of savants as if he were the political ruler of a mighty and friendly empire. The Empress personally took Einstein to the feast of the chrysanthemums in the Imperial Garden, while the German Ambassador and Japan's Prime Minister collaborated in making certain that the visiting celebrity had the opportunity to see Japan's most picturesque sites, from Mount Fujiyama, the 12,395-foot peak which is the king of Japan's mountains, to the tea-bearing hillsides checkered with rice fields and the large, thriving cities where scientific and cultural interests centered. The picturesque pagoda temples, the luxuriant vegetation with the vast variety of bright-hued azaleas, lilies and cherry trees, the natives in their wide straw hats and sandals, and the young women who traveled hammock fashion, carried by two bearers, all enthralled Einstein. And he, in turn, fascinated the worshipful Japanese, who saw in the gentle-mannered visitor an example of that elemental force which they so proudly revered in their majestic Fujiyama. The artless scientist was disconcerted by so much love and respect, and in spite of all his embarrassed efforts to decline the gifts that were showered upon him and his wife, it required several trunks to pack all the mementos which their hosts in-

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sisted they must accept. One of the most unusual gifts was a four-volume book from a rich merchant who had been "honored" to entertain the Einsteins and who himself had produced the encyclopedic literary effort to describe the various tea ceremonies of Japanese high society. And in return the Japanese only asked from the man whom they did their best to deify a few words of learning and an occasional autograph, which Einstein had to paint upon silken materials with long brushes and Japanese ink.

Amid all the public receptions, the interviews, the everlasting posing for photographers, and the seemingly endless formal dinners with oratory and glowing tributes which he could not understand, Einstein delivered a series of university lectures. Of all the celebrations, he found most pleasant those which brought him in contact with the happy, graceful children of the mountainous land. They brought him a big fat book of colored drawings, and in thanking them for their gift Einstein gave a little fatherly advice. He asked the schoolchildren to bear in mind that the wonderful knowledge they gained in school was an inheritance to which they must add, and which they must one day faithfully hand on to their children; for "thus do we mortals achieve immortality in the permanent things which we create in common."

A cynical philosopher has said that one of the greatest pains to human beings is the pain of a new idea. But the young as a rule are more receptive to new ideas than their elders, and with this thought in mind Einstein left with the Japanese schoolchildren a message—the same simple message of international friendship which was so close to his heart and which he had preached in London and in

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Paris and Berlin, wherever and whenever opportunity had beckoned.

Although streaks of gray were beginning to appear in his bushy black hair, Einstein still had a childlike heart which kindled easily with love and sympathy for all children. His young, brown-faced admirers must have sensed this spiritual kinship, for they listened with rapt attention as he spoke of the power of ideals to lift the world into a higher and happier society. In the past, nations lived in ignorance and in hatred of each other; but now a new age was dawning which was to bring about friendly and understanding intercourse among all peoples. The world looked to today's schoolchildren the world over to nourish this spirit, said Einstein, and he hoped that their effort to bring the seeds sown by their elders to glorious flower would be so successful that "your generation may some day put mine to shame."

The Einsteins returned to their modest Berlin apartment in 1923 with hearts full of gratitude for all the blessings they had received. For the Professor, the trip was one of his most profound emotional experiences. It had caused him to lose some of his shyness, and close contact with the everyday life of so many people in diverse lands had enriched the mind and spirit of this man who had lived a cloistered life for so many years. But perhaps the most lasting fruit of his journey was the lively interest in sociological and economic problems which the sight of so much human misery in a world bursting with riches had intensified. The gentle, lamb-like nature of Einstein, desiring social happiness and peace for all, was aroused to anger most easily by examples of man's injustice to man. To him, a great country was a land which did not

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take toll from those of its citizens who were too weak to resist exploitation. He could not forget the unhappier aspects of his visit to Colombo, Singapore, Shanghai and Japan, which had kindled his compassion and shame for human degradation born of economic slavery; and his concern for human misfortunes, which had always been strong, deepened with the years and produced a social philosophy considerably in advance of his times.

Why—he asked himself repeatedly—does this magnificent applied science, which saves work and makes life easier, bring us so little happiness? The answer, he concluded, was that man had not yet learned to make sensible use of it. And his message urging a more humane use of the wealth-producing tools which science had created, and a wiser distribution of the fruits of industry, so that there would not be two classes, one with more dinners than appetite and the other with empty stomachs, began to find its way into his lectures with increasing frequency.

“The benefits that the inventive genius of man has conferred on us in the last hundred years could make life happy and care-free, if organization had been able to keep pace with technical progress,” he pointed out. “As it is, in the hands of our generation these hard-won achievements are like a razor wielded by a child of three. The possession of marvelous means of production has brought care and hunger instead of freedom.”

Speaking as one who looked upon himself as “an independent and honest man who, unburdened by class or national prejudices, desires nothing but the good of humanity and the most harmonious possible scheme of human existence,” Einstein emphasized that only a fraction of the available human labor in the world was needed

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for the production of the total amount of consumption goods necessary to life. Consequently, there was unemployment, a loss in purchasing power, followed by a decline in sales and profits. Such cycles eventually ended in an economic crisis, with banks becoming insolvent and the wheels of industry coming to a complete standstill. Einstein believed that industrial prosperity should be founded on a system which somehow managed to prevent the purchasing power of the masses, measured in terms of goods, from sinking below a certain minimum. Years before the same ideas became a part of the American social philosophy under the Roosevelt New Deal, the Berlin savant advocated—and thereby earned the hatred of many industrialists and self-styled “patriots”—that the economic freedom of industry should be limited in the interest of the common weal to reduce the number of working hours per week until unemployment was systematically abolished. At the same time, said Einstein, a scheme of minimum wages must be fixed in such a way that the purchasing power of the workers kept pace with production; and in those industries which had become monopolistic in character through organization on the part of the producers, prices must be controlled by the state in order to prevent the artificial strangling of production and consumption.

Einstein confessed himself pessimistic concerning state and other forms of communal enterprise, fearing that bureaucracy might prove the death of all sound work. He inclined to the view that the state could be of real use to industry only as a limiting and regulative force. In that capacity, the state, he pointed out, should see to it that competition among the workers was kept within healthy

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limits, that all children received a chance to develop soundly, and that wages were high enough for the goods produced by industry to be consumed. He urged, also, an old-age pension plan which would exclude older people from certain sorts of work and which would give them instead a fixed income, in recognition of the fact that at their age they had done enough work of a kind accepted by society as productive. He would not join those pessimists who believed that civilization was in a state of decadence owing to the development of industry and machinery which made the struggle for existence too severe. For he believed that in time the development of machinery would mean less and less work for the individual, and that a planned division of labor would eventually give to all human beings the security, the leisure and the energy with which to enrich life and to push society to new peaks of progress. As an outspoken optimist he predicted that future historians would explain the morbid symptoms of present-day society as "the childhood ailments of an aspiring humanity, due entirely to the excessive speed at which civilization was advancing."

But no matter what causes he might espouse, no matter what part of the world he might find himself in, Einstein's chief intellectual interest remained in his scientific work. Being a man who possessed a great heart as well as a great mind, he could not help but be concerned with pacifism, Judaism, economic justice, and the other current problems of humanity; and since true greatness makes a man feel that he belongs, at least in part, to mankind, Einstein continued to give generously of his time and energy for the amelioration of human suffering. But a pad of paper and a fountain pen were always within

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reach. Many of the hours during the long journey to and from Japan were spent in solitude as he sat in a deck chair, his lap littered with books and papers. The pensive eyes which watched the white-capped waves belonged to a pathfinder of knowledge who sensed in the eternal motions of the sleepless sea the elusive law of unity in nature which he had been struggling so hard to track down. Back in his own home, he plunged with renewed vigor into the problem of uniting gravitation and electricity in his new field theory, and once again the successor to Newton wore that air of abstracted meditation which gave others the impression that here was a man who belonged to another world, a world in which man was gifted with superhuman powers enabling him to talk with the far-off stars.

When this mood was upon the scientist, Mrs. Einstein found it difficult to persuade him to leave his study, even for a brief visit to one of his cherished operas. And even when she succeeded, she sometimes wished she hadn't. One day, when he had been engaged in a particularly strenuous intellectual combat he was inveigled into accompanying his wife to a tea party given by some intimate friends. The scientist sat on a sofa, saying nothing, lost in meditation on the problem which was torturing him. One of the guests screwed up his courage and ventured to question him about his work. The question burst open the floodgates. Nothing relieves pent-up emotion and intellectual strain so much as conversation, and soon the scientist was launched in a vehement monologue which no one among his embarrassed friends could follow. One of them sought to distract his attention—the professor enjoyed playing the violin, did he not?

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"Yes," the scientist answered vacantly. "I play the violin."

He stared at his questioner with unseeing eyes, then abruptly, turning to the others in the room, he resumed his monologue. Sitting bolt upright, his clenched hands on his knees, his eyes in space, he talked on and on. His friends listened to the unintelligible soliloquy with pity and sympathy, wishing they could help him but knowing that they could not. For they understood that Einstein was talking to himself, was heroically trying to get the better of his torment. Suddenly, there was an abrupt stop to the outpouring. The dazed savant was on his feet, struggling into his old, worn professorial coat and black slouch hat. His pale face appeared pasty in the rapidly fading twilight, as he mumbled a few words which the company took for a farewell; then he was on the cold streets of Berlin, alone amid the jostling throngs as he tramped for hours with collar turned up against the biting wind until his tormented soul had found a measure of comfort and solace. He felt sheepish as he entered his own apartment late that night. The understanding Mrs. Einstein greeted him with a cheerful smile, as she bustled with motherly solicitude to get him some warm supper. The tea party was something in the past, and neither mentioned it again.

The ritual of fame in its Spanish form greeted Einstein in 1923 as he traveled to Madrid to receive an honorary degree from the University of Madrid and to be a guest of King Alfonso XIII. Two years later, he again interrupted his scientific investigations, this time to make a lecture tour of South America which turned into a triumphal procession as presidents, prime ministers, savants, and

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cheering crowds turned out in each capital to extend their homage to the world's first citizen. And England, completing its rapprochement with German scholarship, elected Einstein its Cecil Rhodes Memorial lecturer at Oxford. He told a Berlin audience shortly after his return from South America that "the further we proceed the more formidable are the riddles facing the universe"; shortly thereafter an American foundation made available funds to give Einstein an assistant, and Dr. Walther Mayer, a mathematician formerly of the University of Vienna, received a fellowship for an indefinite period to check aspects of the field theory which was absorbing Einstein.

The Professor acquired, as well, a new son-in-law. Among the visitors to the Einstein home was a Russian scientist and writer, Dr. Dimitri Marianof. Dr. Marianof and Einstein's stepdaughter, Margot, fell in love and became engaged. Dr. Einstein consented to be present at the wedding, and to give his daughter in marriage, if he were assured that he would not be away from his study for more than half an hour. One day late in November the Professor, wearing an old slouch hat, a weather-beaten raincoat, a baggy business suit, and a celluloid collar, in place of the top hat and cutaway coat which German tradition decreed a father should wear at a wedding, appeared at the Registry Office in the Schoenberg district of Berlin to fulfil his rôle of husband and father. But so far as the rest of the world was concerned he was the chief character at that wedding. A battery of news photographers and a small army of newspaper reporters were present to record that Professor Einstein, who lived in a realm where few men could follow him, acted like any other

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embarrassed and flustered father at the wedding of a loved daughter; and they harried the scientist so much that it was nearly an hour before he was able to return to the studies which engrossed his days.

The greatest geniuses produced by humankind often unite in themselves the rare qualities of both the sensitive artist and the creative scientist. And Einstein was not only an extraordinary mind in search of truth, a genius who grappled with the mysterious forces of the universe and succeeded in unlocking heretofore sealed pages from the Book of Nature, but also a wizard in perhaps the greatest of the arts. He had a profound appreciation of classical music, especially as a significant expression of human experience, and his own ability to play the violin was described by the foremost violinist of the day as of the highest quality and the equal of many professionals. In music, Einstein found both solace and inspiration; his piano and his violin helped to lift from his mind and heart the weight occasioned by intellectual labors and human folly, and at the same time stimulated an uplift of his being which led him to hear in music the harmonious voice of creation—of that invisible world beyond the twinkling stars which man's mind has sought to penetrate since the dawn of history.

To Einstein, the essence of music was best represented in the works of Bach, Beethoven and Mozart. Bach, he declared, was the crystallization of a Gothic cathedral, and to appreciate him one should "listen, play, love, revere, and—keep your mouth shut!" Bach's Chaconne and Beethoven's Tenth Sonata always moved him deeply. As a boy, he was enthusiastic about Schumann, but he was only 15 when he concluded that Schumann did not

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possess the last word in musical originality. The pure musicality of Bach and Mozart was revealed to him, and he learned to love the melodious many-sidedness, the delicacy of detail and the natural gaiety and grace that flowed from their compositions. In the variability of Mozart's music, Einstein found the highest and most tuneful simplicity in music, a hundred singing streams uniting in a great river of rich melody and moving simplicity. Beethoven, on the other hand, represented violent strength, and the scientist confessed that he needed a little running start in order to attain to Beethoven's great symphonies. Wagner provided a mixed reaction, and although Einstein obtained some of his greatest musical moments from Wagner's operas, these were followed by considerable emotional distress which he was unable to explain to himself. He liked also old Italian music and the compositions of German romanticists, but modern music left him cold. And Japanese music, of which he had to hear a great deal during his visit to the Far East, he considered barbarous.

"I personally feel the highest possible degree of happiness through great works of art," Einstein confessed. "From them I receive spiritual gifts of such strength as I cannot receive from other things. In my life the artistically visionary plays no mean role. After all, the work of a researching scientist germinates upon the soil of imagination, of vision."

This intuitive search for harmony and clarity was responsible for Einstein's two great loves, mathematics and music. The mysterious force which inspired an artist to arrive at his musical conceptions partly by intuition was also the most valuable ally of the creative scientist, in

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Einstein's opinion. It seemed to him, moreover, that harmony was the equivalent of beauty and of pleasure. He believed that intellectual joy is closely related to esthetic enjoyment, and that one's creative labors are prompted by a burning curiosity and a certain mental and spiritual obsession which cannot always be fully explained.

"Music and physical research," he argued, "originate in different sources, but they are interrelated through their common aim, which is the desire to express the unknown. Their reactions are different, but their results are supplementary. As to artistic and scientific creation, I hold with Schopenhauer that their strongest motive is the desire to leave behind the rawness and monotony of everyday life, so as to take refuge in a world crowded with the images of our own creation. The world may consist of musical notes as well as of mathematical rules. We try to compose a comprehensive picture of the world in which we are at home and which gives us a stability that cannot be found in our external life."

Improvising on the grand piano which stood in his study was Einstein's chief relaxation from work. As a child, he had composed ditties glorifying God and nature; but as an adult, these charming improvisations took on a more mature form reminiscent of Mozart. During the trips that took him far from home, he missed nothing so much as his beloved piano. He loved it as if it were a human being. On his return from Japan, while Otto was still helping to bring in the trunks and without bothering to remove his hat and coat, he rushed to his piano and quickly was lost in reverie and forgetfulness as the instrument rang forth with his odd improvisations. It

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was his way of talking to his piano, of extracting from it that spiritual medicine which was balm to his mind and soul.

Much of Einstein's leisure time was spent also in playing the violin, especially in trios and quartettes with musical friends. His skill with this instrument was self-taught. He preferred to play his violin in the kitchen of his home rather than in any other place. The reason for this fancy was that he found the acoustics better there. Hardly a day passed that he did not seek medicine for his troubled mind from his violin; sometimes he performed alone, sometimes with friends; sonatas and concertos and chamber music had a special fascination for him, and on the tuneful wings of such composition he was quickly lost in reverie. His unusual proficiency as a violinist put him in great demand to play at charity concerts, and he occasionally consented to take part in behalf of one of his causes.

One of his concert appearances led to an amusing incident, which became Einstein's favorite story upon himself. A musical critic who had never heard of Einstein was covering a charity performance in a small German village at which the famed scientist was the guest of honor. The local reporter inquired as to the identity of the distinguished-looking violinist and was informed: "Why, that is the world-famous Einstein!"

That was enough for the journalist. He knew nothing of the theory of relativity, but was sure that he had heard one of the greatest musicians of the world. He rolled up his sleeves, and with his typewriter in front of him and dictionaries and encyclopedias on all sides, he described

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Einstein's performance on the violin as "one of the greatest marvels in the history of music."

"The other geniuses of the violin," wrote the youthful critic, "would have paled last night had they been there to hear the playing of the greatest master of them all!"

And Einstein, who hated publicity and was displeased whenever he saw his name or his photograph in the newspapers, treasured that clipping. He would show it with delight to his friends, and slyly observe that he was prouder of it than any of his achievements in the realm of physics, mathematics and astronomy.

Einstein discovered, however, that being a virtuoso of the violin also added to his troubles. He still considered the public interest in him a plague, and now that people had found out that he was a proficient musician as well as a great scientist this plague became even more annoying to him. Newspaper editors from the four corners of the globe cabled their Berlin representatives to obtain a photograph of the famous scientist with his violin. At first Einstein refused. He was, he emphasized, heartily tired of seeing his portraits published. That sort of thing was all right for a prima donna who wanted advertising, but not for a serious scientist. As for posing with his violin, that was out of the question: "Next they will be wanting me to pose standing on my head!" But the large-hearted scientist never failed to respond to an appeal to his philanthropic instincts. Many of the children of Vienna, he was told, were starving, and it would be very helpful to the fund-raising campaign if Einstein would permit his picture to be taken with his violin. So Einstein, who "heartily" hated being photographed, consented to

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pose so that his pictures might be sold for the aid of Vienna youngsters.

He himself, shortly afterward, needed all the loving care and attention that his family and medical science could provide. For early in 1928 he fell dangerously ill from a severe heart attack. For four months he remained in bed, and for almost a year he was a weak man. This weakness, however, was entirely a physical disability. His mind lost none of its keenness, and his inquisitive interest about world affairs nearly drove his physician, a world-renowned New York heart specialist, frantic. Finally, in desperation, the physician memorized one hundred and fifty funny stories and told them to his celebrated patient. Others assumed that this was another form of medical treatment, designed to keep Einstein cheerful.

"Not at all," the physician said with a wry smile. "I have to tell him funny stories in self-protection. He asked me so many questions that I was constantly embarrassed by my ignorance. When I found that he liked jokes, I memorized them to stop his constant flow of questions."

Otherwise, Einstein was a model patient. He never complained about his inability to move about, or about the tediousness of his rest cure; those in attendance sometimes even suspected that to the scientist his protracted illness was not entirely a misfortune. The peace and quiet of the sick room permitted Einstein to think and to engage in his cosmic voyages undisturbed. The year of his sickness found him making rapid advances toward the formulation of a unified field theory, which he had set as his life goal, and early in 1929 he published a preliminary report in five pages of intricate equations which represented his attempt to find a mathematical ex-

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pression to represent comprehensively the laws of gravitation and electromagnetism. The public reaction to this latest of his formal documents drove the Professor "nearly crazy," according to Mrs. Einstein, who sought anxiously to protect the still weak scientist from every possible annoyance. Einstein himself said of his new theory that it would be a waste of time to try to elucidate it for the public because of the tremendous technicalities it involved. But this did not diminish the public acclaim. Once more this Olympian interpreter of cosmic mysteries had unlocked the sealed book of Nature, and people in all lands sent up hosannas for their hero. Over the vigorous but futile protests of the scientist, who maintained that the public could not possibly understand it, the new theory was cabled at great cost to the leading newspapers of the globe. Thus Einstein was responsible for the breaking of another long-standing tradition, a journalistic one, this time; for never before had mathematical formulae been introduced into cabled news dispatches.

To avoid the celebration which Berlin was planning for his fiftieth birthday, on March 14, Einstein fled from town. He wanted to hide where nobody could find him, and he found such a refuge in a small outbuilding used as a gardener's cottage on the beautiful estate of Franz Lemm, Berlin's shoe-polish king. He lived there alone, even preparing his own meals. As March 14, 1929, approached, there was a spontaneous and extraordinary demonstration of public esteem which testified to the love and respect which millions had for him; the principal newspapers and magazines of the world appeared with photographs and articles about Einstein; gifts and congratulatory messages of all sorts poured into the scientist's

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Berlin home, and innumerable friends and well-wishers called to greet him personally. For these disappointed friends, the scientist's secretary had the same pat message ready:

"Professor Einstein stole out of town quietly a few days ago to escape possible ovations. I have strict orders not to tell where."

On the day itself the scientist's wife and daughter threw newspaper men off the scent and arrived unobserved at the out-of-the-way gardener's cottage for a family celebration. They brought with them in a self-cooker a special dinner consisting of the dishes that Einstein liked particularly well. There were mushrooms, stuffed pike, braised vegetables, salads, stewed fruit, and a tart. There was no coffee or wine, as these were forbidden him because of his heart trouble. But as a special birthday favor he was allowed to smoke his pipe.

Gleeful in the knowledge that the whole world was looking for him and could not find him, Einstein, his graying wavy hair the only sign that he had reached the fifth decade of his life, sat down happily with his family. As a rule, he considered birthday celebrations rather ridiculous, but today he was glad to have one. Truth to tell, he had not been too successful in feeding himself during his self-enforced exile from his Berlin home, and his wife's well-cooked dishes tasted good.

A great man, it is said, never loses his child's heart, and the dinner finished, Einstein, as happy as a boy with a new toy, began to demonstrate a microscope which a friend had sent him as a birthday gift. Suddenly there was a surprising knock at the door. An intruder with a sheepish smile appeared, the Berlin representative of an

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American newspaper. The scientist looked upon him with gentle reproach.

"Who told you where I was?" he demanded.

Failing to get an answer he probably had not seriously expected, he remarked: "You seem to have a good nose."

The newspaper man was permitted to stay a few minutes, to watch the scientist, dressed simply in plain trousers and dark brown sweater and slippers, as he pricked his thumb with a needle and then excitedly examined with his daughter the drop of blood thus extracted under the microscope.

It was not until his birthday was nearly a week old that Einstein returned to his own home to find out how well the world had remembered his natal day. Three huge washbaskets were filled with letters, cablegrams and birthday cards. They came from all parts of the world, from the Chancellor and the German government, the King of Spain, the Emperor of Japan, the President of the United States, prime ministers, college presidents, fellow scholars and friends without number. There were many gifts, too: a sailboat from his students, several violins from friends, and such practical presents as dressing gowns, neckties, handkerchiefs, books, and delicate shaving soaps. The last Einstein gave away, for he still adhered to his belief that one kind of soap was enough in life, and a soap good enough to wash with was also good enough for shaving. Included among the birthday greetings were many from poor people, seamstresses and laborers, who could not know anything about relativity but who loved the scientist as a kind and good man, a benefactor of humanity. Einstein was particularly touched by the gift of a small can of tobacco which an unemployed workman, with a

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few pennies he had been able to scrape together, had sent him with the message that while the gift was "relatively" small, it came from a good "field." With tears in his eyes, Einstein composed a thank-you letter in verse. World-renowned scientists, rulers and potentates had to wait while he acknowledged the birthday greetings of a poor man out of work.

The City of Berlin sought to honor its first citizen on his fiftieth birthday in an impressive style befitting one of the world's largest and richest cities. A bust of Einstein was unveiled in the Einstein Tower, a new building in the latest manner of modern architecture which had been added to the Astro-Physical Institute of Berlin for observation of the stars. But that was not enough for the city fathers. They wished to honor Einstein—and in honoring him, honor themselves—in a more grandiose fashion. They knew he loved sailing. So they decided to give him a small estate on near-by Lake Wannsee in order that he might indulge his love for the water whenever he desired. When Berlin had absorbed the suburb of Cladow during its period of expansion, it had acquired also a picturesque little park which contained a small dignified house built in the classical style at the water's edge. It was this house that the city fathers, feeling proud of themselves in their good intentions, offered to the Professor. No one foresaw the anticlimax which was to cap their good intentions; for with this proffered gift began a comedy of errors such as probably never has been duplicated by any other great city, even in a Gilbert and Sullivan fantasy.

While the newspapers of Berlin blazed forth with pictures of the "Einstein House," Mrs. Einstein decided

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to inspect the estate. The charming little house overlooking the lake, with its groves of shaded fruit trees, filled her with enthusiasm; but she was disquieted to find that the family von X were still living in it. What was even more embarrassing to her was to be told by Mr. von X that he could not possibly imagine how the Einsteins expected to become the new proprietors since the city of Berlin, upon acquiring the park, had guaranteed to him the right to remain there. Painfully surprised, the officials in the City Hall dug up the old records and to their chagrin discovered that they were giving away something they did not own. Feverishly they sought a solution of their dilemma before the embarrassing situation should become known to the newspapers.

The park at Cladow was quite large. Why not set aside part of it for another residence? This seemed like a happy solution for a perplexing problem, and a suitable site was chosen for the erection of the proposed summer home of the Einsteins. The Professor and Mrs. Einstein were gratified—until someone appeared with a forgotten document that forbade the erection of another residence within the park! Berlin again had to withdraw its “gift.” Meanwhile, the public had learned of the serio-comic situation, and the project rapidly took on the dimensions of a major political scandal.

Undeterred by their grotesque blunders, the city authorities tried a third time. The estate at Cladow owned a farm which fronted on the Havel with its chain of lakes, and, while not comparable in scenic charm to the park site, it was deemed a satisfactory gift. The city fathers began to puff up with civic pride once again as they prepared for the festal occasion on which they would present the

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farm ceremoniously to Professor Einstein. But Mr. von X, who was living in the park residence, presented proof that the farm land, too, was under his jurisdiction. The comical scandal burst in all the German papers, and millions were soon laughing at the ruffled municipal council. And no one thought the situation funnier than did Professor Einstein, who, ever ready to forgive human error, asked the city council to forget all about making a gift to him.

But by this time the project of an Einstein summer home had become a *cause célèbre*. The city authorities were the subject of the best efforts of the Berlin wits and were in danger of being laughed out of office. The Mayor of Berlin called personally upon Einstein and begged him to reconsider. Through their mists of error, the city fathers had glimpsed a new plan which called for the purchase by the city of a new location to be selected by Mrs. Einstein, and the scientist was persuaded to accept it. The Professor's wife, after considerable trouble, found in the sleepy village of Caputh, about an hour's ride from Berlin, a wooded site upon a small hill with a charming view of the Havel and near-by hills and forests. The rulers in Berlin approved the choice, and negotiations for the purchase of the property and the erection of a suitable home were begun.

But at this point the irregular course of the farce took a new and unexpected turn. Since the purchase of the property involved the expenditure of city funds, it was deemed advisable to ask the approval of the municipal assembly. But several German Nationalists objected to the project when it was first proposed, thereby forcing it upon the calendar for future debate. While there was no ques-

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tion that the assembly in the end would approve the purchase of the summer home for Einstein, the scientist would not permit his name to become the subject of a political discussion. He bluntly informed the city authorities that he would not allow himself to be dragged into petty party strife and could not therefore look any longer upon the proposed gift as acceptable. Thus ended the extravagant farce of Berlin's municipal gift to Einstein.

But the city's blunders had placed the scientist in an embarrassing position. The owner of the land in Caputh had been promised purchase, and an architect already had completed the drawings for the new home! Although it meant a heavy financial strain upon his meager resources, Einstein decided that he was in honor bound to go ahead with the project with his own funds. The philanthropic scientist, who had been generously donating a large part of his financial resources to charity, was hard put to it to raise the necessary capital; but when the simple cottage was completed within a few months he had the satisfaction of knowing that the expenditure was the best financial investment he had ever made.

For the modest summer home set among pine trees not only provided peace and quiet for work, but also ample facilities for the sailing which gave him inner freedom and peace while it brought him closer to Nature's invisible throne. Einstein knew no greater joy than to sit in the stern of his little yacht *Tummler*, tiller in hand and pipe in mouth, lost in reverie. Sometimes he sailed aimlessly for hours, letting the boat drift where it would, quietly enjoying the scenery about him and the smooth motion of the craft under him, while his mind sailed out into space on the winds of mathematical formulae. Sev-

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eral of his most important scientific discoveries were made as he cruised about in his sailboat, while he appeared to be doing nothing more than enjoying the indolence and the taut sheets that appealed to so many other sailors. Back from his pleasant tussle with the curves of a breeze-filled mainsail, the scientist stamped about through his garden in the rough clothes that would have sent shudders down the back of a fashionable tailor; then, fully rested, he would retire to the study which had been built for him in a corner of the plain wooden cottage to resume in solitude his exacting work with another kind of curvature, that of mysterious and awe-inspiring space.

The villagers of Caputh soon became familiar with the figure of the scientist with the poet's face and the bushy, graying hair, and his appearance on Caputh's single street usually evoked dozens of friendly greetings. The Professor never owned a car, and when he wished to travel to and from his Berlin residence he made the trip on foot and by bus to the suburban railroad station at Potsdam, whence a train took him the rest of the way to the German capital. On one such journey he discovered in the ticket office that he did not have enough money for his railroad fare. He would not accept the ticket on credit, in spite of the importunities of the clerk. He searched through every pocket, but no more money was forthcoming; so he decided to postpone the journey. Before returning what money he had with him to his pocket, he tried adding it up again and found to his surprise that he had made a mistake and did have enough to purchase the ticket after all.

"Ach!" said the Professor with a naïve smile. "You see what a fine mathematician I am!"

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Einstein's mathematics showed a consistent weakness—though his wife suspected it to be a deliberate weakness—in one other respect. Owing to his heart malady, his smoking had to be curtailed. Whenever Mrs. Einstein saw her husband with a pipe in his mouth, she quickly inquired:

"Albert, how many pipes have you had so far today?"

The answer invariably was "One."

To pursue his scientific explorations into the mysteries of creation, Professor Einstein accepted during the latter part of 1930 an invitation to visit the International School of Advanced Science at Pasadena, California, where American and foreign scientists of note gathered annually for a few months' study and exchange of ideas. But when the Einsteins arrived at the pier of the steamship *Belgenland* for their four-month trip to the New World, a hitch appeared which for a time threatened to disrupt all the carefully planned arrangements for the voyage. Company officials, without consulting the Professor, had set aside the finest de-luxe accommodations for the distinguished traveler and his wife. But Einstein, with his strong scruples against wealth and luxury, would have none of it; he demanded, instead, steerage cabins. Mrs. Einstein, who understood her husband better than anyone else, sought to placate him by pointing out that his request would hurt the feelings of the officials of the line; and since the Professor did not want to harm the sensibilities of anyone he yielded to this gentle pressure and accepted the de-luxe suite of rooms!

That strange compound of cosmic wisdom and child-like innocence in worldly matters made Einstein yield easily to the importunities of others. This amiable inabil-

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ity to say "No" when others wanted him to say "Yes," was amply illustrated upon his arrival in America. The *Belgenland* stopped for five days in New York harbor on its way to the Pacific coast. Before leaving Germany early in December, Einstein had vehemently affirmed that he was going to the United States for scientific research and that he would not, under any circumstances, give interviews, pose for pictures, take sightseeing trips or make speeches. He still remembered the ceremonial of fame with all its disadvantages which had accompanied his trip to the Far East, and he was determined, he said, to spend the five days which the liner was to pass in New York aboard ship. But he had spoken without knowledge of that hero-worshipful attitude which leads Americans to shower adulation upon the great.

Einstein had made a brief visit to the United States ten years earlier—when he was comparatively unknown—in behalf of the Hebrew University in Jerusalem; in the decade succeeding that short lecture tour his fame had grown to imperishable size and America was now ready and anxious to express its admiration and homage. So it was that the famous scientist, who a week before was expressing his firm resolve to eschew all public and social contacts, found himself chevied into doing just the opposite upon his arrival in New York. His five days in the metropolis were spent in an almost endless round of interviews, receptions, public appearances, speeches, sightseeing trips—including a tour of Chinatown and the Art Museum—teas, radio broadcasts and handshakings.

To Einstein, according to an oft-repeated sentiment, mass newspaper interviews were comparable to being bitten by wolves or being hanged; but the *Belgenland*

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had barely quit Quarantine when the frightened scientist found himself surrounded by more than one hundred eager reporters and photographers anxious for the great man's opinions on subjects as widely divergent as the fourth dimension, prohibition, religion, politics, the New York skyline, feminism, and the virtues of the violin. As the Statue of Liberty hove in sight, the nervous Einstein found himself promising to give a fifteen-minute interview. In this emergency, Mrs. Einstein, serene and motherly, stepped to her husband's side and hovered about him like a protecting angel, brushing aside annoyances whenever she could and with a smile or a touch of the hand encouraging her husband during his ordeal.

The bewildered visitor, who later confessed that his "torture" had given him "an insuperable impression of the life rhythm of the present American man," sat down with an air of resignation and did his best to answer the questions that came popping with machine-gun rapidity from the badgering newspaper men perched all around him. Many of the queries were either unanswerable or too controversial, and the Professor parried them with a jest.

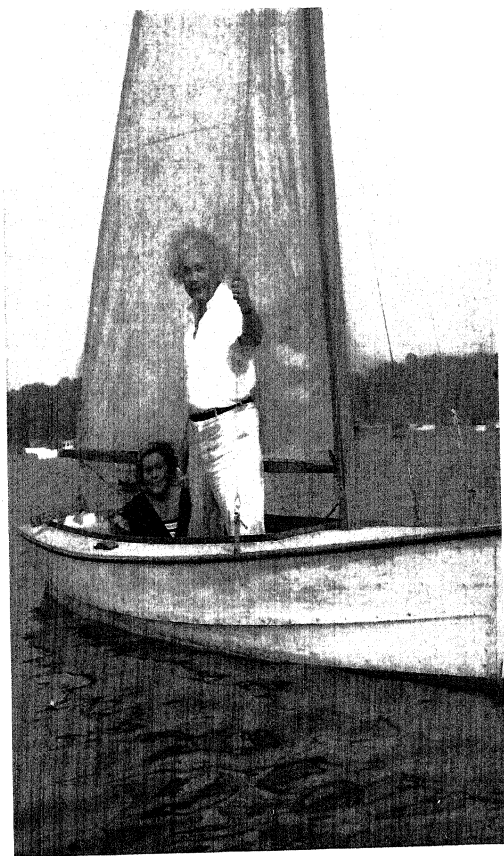
"Professor Einstein, could you define your theory of relativity in one sentence?"

"It would take me three days to give a short definition of relativity," replied the scientist modestly.

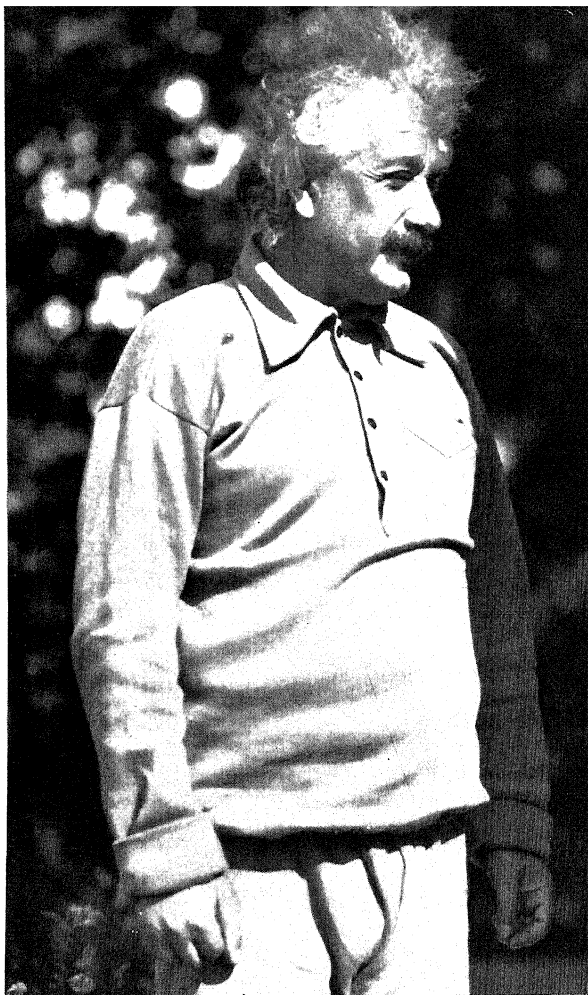
"Have you got your violin with you?"

"No. I left it home, because I was afraid the tropical climate we will encounter going to California by way of the Panama Canal might harm it."

"Do you think religion can promote the peace of the world?"



SOME OF EINSTEIN'S HAPPIEST HOURS ARE SPENT IN A BOAT,
CLOSE TO THE BELOVED WATER WHICH SPEAKS TO HIM OF THE
POWER AND MYSTERY OF NATURE



READY FOR A HIKE

His feet will ramble through the woods, but his imagination will voyage through boundless time and space

FROM A PULPIT BUILT OF FAME

"Up until now religion has not done it, and as to the future—I am not a prophet."

"What does the future hold for the world?"

But that was more than even a cosmic sage could be expected to answer. Besides, the fifteen minutes he had promised were up. So, remarking that "even a cow can give only so much milk, gentlemen," Einstein jumped to his feet, looking like a man who would gladly part with his most cherished possessions in order to escape from the inquisition of fame.

But the ordeal was not over yet. The impatient photographers were anxiously awaiting their turn, and as the scientist, dressed in a black topcoat and a wing collar which gave him a ministerial appearance, appeared on deck they set to work. His gray hair waving about his pale face like an aura and his hand nervously clutching his black felt hat, Einstein faced his assembled "adversaries" as they proceeded to make a celluloid record of his arrival. Twice he tried to escape, and twice he was pulled back. But at last he could stand no more, and he turned and sprinted as fast as his pudgy legs would permit toward a corner of the deck, and before the surprised photographers could catch up with him he had disappeared down a companionway.

A reporter who had missed the interview found the Professor in seclusion in his stateroom. "Go away," said Einstein, in his gentle, reproachful manner. "Go away, please, immediately." The disappointed journalist started to beat a retreat, but the large-hearted Einstein, seeing the keen chagrin on his face, had a change of heart. "Come back, young man," he called out, "and I shall try to answer your questions." Although pen-and-ink artists were

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also barred at this time, one of them managed to sneak into the dining room where Einstein was having luncheon with a small group of friends. The sketch thus surreptitiously made was shown to Einstein, who, forgetting his command against such pictures, not only rewarded the recalcitrant artist by autographing it, but added a little rime beneath it:

This fat, well-sated pig you see
Professor Einstein purports to be.

Having thus had some fun at his own expense, the Professor prepared to leave ship to take part in the welcome which the city had arranged for him.

The official reception was one of the most impressive in New York's history. The tousle-headed genius was escorted from his ship to the City Hall through much the same gantlet of public acclaim as confronts renowned aviators and other popular celebrities. But the formal welcome at City Hall had an added dignity, for the committee selected to greet Einstein included many of the most distinguished men of the metropolis and was headed by Dr. Nicholas Murray Butler, president of Columbia University, himself one of the world's foremost figures. Professor and Mrs. Einstein stood on the dais of the aldermanic chamber at City Hall, nervous but smiling, amid a group of distinguished New Yorkers which included John D. Rockefeller, Jr., Professor John Dewey, Mayor Walker, Adolph S. Ochs, Felix Warburg, and the German Consul, while President Butler welcomed the scientist as "the ruling monarch of the mind," a man who had given the world "an intellectual lighthouse."

Professor Einstein, declared the president of Columbia,

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had taken his place in the great succession of universe-makers which began with Archimedes and Ptolemy and continued down through Copernicus, Newton and Kepler—"one of those gifted with the almost superhuman power to use the loftiest elements of intelligence to take this universe more completely to pieces, to see alike into its great distances and into its remotest depths, and to give us for our intellectual satisfaction a completer knowledge of this mysterious universe, this amazing world in which we live."

"The territory over which he rules" the speaker continued, "is not bounded by widespread seas, by high mountains, by broad rivers or by any conventional line which separates peoples and divides languages. The territory over which his fame has gone and over which his authority extends flies no one flag and speaks no single tongue. It is the realm of ideas where men and women of every race, creed and clime may meet and claim common citizenship.

"It is not without significance and greatly to the honor of this metropolitan city and its government that at such a moment we pause, and gladly pause, to celebrate the presence among us for all too brief a time of this ruling monarch of the mind. Our thoughts are absorbed the whole world round with grave questions of political, of social, of economic policy and betterment. Mankind is perplexed and anxiously seeking for light and for leadership in order better to deal with the grave problems and pressing situations of the most real and practical character which confronts it on every side. And yet wisely and properly, at this very moment, we raise our hands in salute to one whose repute, whose fame, whose influence,

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lies far away from all this—in the realm of pure thought. This visiting monarch of the mind has to do directly with those mysterious thoughts, relations and formulas which only the gifted few may hope clearly to understand and fully follow.”

Einstein, President Butler revealed, had given serious consideration a few years earlier to an invitation to join the faculty of Columbia University, “but the claims of the homeland were too strong, and we must content ourselves with this brief visit.” And as President Butler and Dr. Einstein and the German Consul beamed upon each other and the other guests, the band struck up “Deutschland Ueber Alles.” No one in that historic gathering dreamed that Einstein’s cherished ties to his native land were to be cruelly shattered in the near future by a nation caught in the relentless embrace of prejudice and that the same distinguished visitor was to land once again on American soil—this time as a fugitive and an exile.

Another side of the tremendous respect and popularity in which Einstein was held appeared during his visit to the Metropolitan Opera House, to which he was lured by the promise of Mme. Jeritza to sing in “Carmen.” The Professor and Mrs. Einstein slipped into the box of Director Giulio Gatti-Casazza, hoping they would be unobserved. But it was a vain hope for Einstein to expect to go anywhere around New York unnoticed. His picturesque shock of hair, the gentle poet’s face and kindly eyes, had been publicized with all the fanfare of which American journalism and the silver screen are capable. Necks began to twist, fingers to point and tongues to clatter within a few seconds after Professor Einstein sat down to enjoy Mme. Jeritza’s animated rendition of the

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famous Habanera. The center of attraction no longer was the illuminated stage; it was the Professor's box. Finally, some one in the balcony waved a hand. Dr. Einstein waved back. At once, there was a spontaneous outburst of applause such as the dignified interior of the Metropolitan had rarely if ever seen. People clapped their hands, then they cheered; finally they rose in their seats and stamped and cheered enthusiastically for several minutes. Einstein, tremendously embarrassed by the unexpected ovation, alternately bowed and waved his hand in greeting, until the audience quieted down and the performance was resumed. Then he sank back into his cushioned armchair and mopped his brow. The demonstration of good will had left him limp with nervous perspiration.

At the end of the opera Professor Einstein went backstage to thank Mme. Jeritza for her performance. An amateur scientist in the group in the star's dressing room showed the visiting genius a definition of relativity: "There is no hitching post in the universe—that we know of." The Professor, in holiday mood once again, amiably appended his signature and the legend: "I have read this and found it right." When he emerged from the dressing room, he found photographers on hand in droves. He gave them one frightened look, and then sprinted across the stage toward the exit. He did not moderate his pace until he found a welcome shelter in the dark corner of his motor car. No amount of cajoling could induce him to come out of his safe retreat.

His daily experiences with lion-hunters perforce instilled into Einstein's gentle nature a bit of iron with which to resist at least some of the multitudinous demands upon him by those who wished to bask in reflected

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glory. Once arrived at his destination in Pasadena, where he found himself surrounded by some of the world's greatest scientists and such concentrated facilities for the study of the universe as he had never seen, he eagerly became immersed in research studies, and, with the aid of his American colleagues, side-stepped many of the social demands upon him. He had come to Pasadena primarily to investigate further the close relationship which he believed existed between gravitation, light, electricity and electro-magnetism, and he was determined not to be distracted from his main purpose.

Society had no temptations for him, and although the nabobs of the country pleaded for his presence he politely evaded all invitations except those very few which actually promised intellectual stimulation. One persistent society woman of note, conscious of the increased social prestige which Einstein's company would give her, sought him out with her most skilful powers of dulcet persuasion. Could Einstein come to dinner on Monday? No, he was engaged. But then perhaps Tuesday or Wednesday would be convenient? The Professor, it appeared, "unfortunately" would be busy with conferences on these nights. Mrs. X, who knew nothing of four-dimensional physical laws, was beginning to get a glimmering at least of Einstein's simpler rules on three-dimensional social relativity; but she persisted with one last hope. Would Thursday evening be all right?

"Ach, I am so sorry," said Einstein, "but I have promised to go to the Mount Wilson Observatory that night to look through the telescope."

New hope shone in the eyes of the dauntless Mrs. X, as she pounced eagerly on that excuse. It had not rained

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for a long time, she pointed out, perhaps it would rain on Thursday, and then Einstein could come to the party she wished to have for him.

"Oh, no," replied Einstein blithely with that famous naïve smile of his, "it won't rain. Michelson has arranged for that!"

The meeting between Michelson, the former midshipman who now, at 78, was recognized as the world's high priest of light, and Einstein, the former patent examiner who had utilized the older man's pioneering investigations into radiation and the ether for his own revolutionary achievements, inspired in both a feeling of intense respect and admiration. Einstein, whose fame now overshadowed that of any other scientist on earth, insisted upon treating the older man as a wiser master at whose feet he had come to take counsel. However, Einstein himself was the center of the intellectual and scientific life of the group of humble though great investigators who, as the modern successors to the royal line of Archimedes, Copernicus, Galileo and Newton, had dedicated themselves to the study of the eternal aspects of Nature. Professors and research scholars approached him as they would an older, beloved fellow student, and only when they were sure they had something worthwhile and interesting to discuss with him.

An occasional musical gathering in the home of friends, two or three visits to the motion-picture theater—during one of which he witnessed the premiere of Charlie Chaplin's "City Lights" as the actor's guest and was made to weep by the sorrowful adventures of the blind flower girl—afforded some respite from the strict regimen of science. But Einstein's most memorable experience was his visit

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to Mount Wilson Observatory to see at first hand the great adventure of astronomers engaged in pushing knowledge to the outermost boundaries of space. He was awestruck as, clad in a borrowed fur coat, he arrived at the observatory atop a 5000-foot mountain. He loved giant mechanical apparatus, though he was no expert in using them, and he enthusiastically set about examining the complex devices of the 100-inch eye. At the suggestion of Director Adams, his host, Einstein bent to the eyepiece to gaze at the shimmering stream of the Milky Way. Suddenly he stood up excited, and pointed to the cement floor, twenty feet below, which seemed to be revolving in the moonlight that fell through the slit in the lofty dome.

"Why, the mountain is spinning!" he exclaimed.

Director Adams, pleased with his little joke, smilingly reassured him:

"It's the dome that's revolving and carrying you with it. You know, relativity."

When early in March, 1931, Professor Einstein said "Auf Wiedersehen" to America, it was with a heart full of gratitude and admiration that he boarded the home-ward-bound steamer. And he did not lack tangible evidence of the admiration that Americans had *for him*. For in addition to the intangible gifts of the inspiring intellectual intercourse which he had enjoyed, the German savant carried with him such three-dimensional presents as California grapefruit, hand-made Indian dresses, beautiful Navajo baskets, petrified wood from Arizona, several cactus plants, and fine violins. He steeled his backbone, however, when an ardent admirer insisted on presenting him with a Guarnerius violin valued at \$33,000. Einstein

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refused the gift, with the comment that "a superb violin like this should be played only by a master."

Emerging from the avalanche of American hospitality as the same simple and unaffected man of research who had confronted with nervous fright an army of American newspaper men in New York harbor a few months previously, Einstein spoke with obvious sincerity as in his farewell greetings he told Americans that their country, "through hard but peaceful labor, had achieved the position of undisputed preeminence among the nations of the world." America was the one great citadel of the ancient and high ideal of a political democracy, with incalculable influence in the shaping of international relations, and he hoped she would lead other nations toward the elimination of "the dreadful tradition of military violence" and toward closer harmony and cooperation among all peoples. But what he admired in Americans above all else was their "joyous, positive attitude toward life."

"I feel that you are justified in looking into the future with true assurance, because you have a mode of living in which we find the joy of life and the joy of work harmoniously combined," he told them. "Added to this is the spirit of ambition which pervades your very being, and seems to make the day's work like a happy child at play."

Some one asked Einstein what he thought of Adolf Hitler, and of reports that as the leader of the German Fascists his power over the German people was growing. The homeward-bound Einstein suddenly became grave, and there was an unusual vehemence in his voice as he replied:

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"I do not enjoy Mr. Hitler's acquaintance. Hitler is living on the empty stomach of Germany. As soon as economic conditions in Germany improve he will cease to be important."

But in making that prediction the distinguished author of the laws of relativity failed to take into account the strange follies and vagaries of lawless politics and benighted public passions, as he himself was soon to discover sadly.

VII

EXILE

I am convinced that, left alone, people would not hate each other. If they were not stirred into hating each other they would live amicably together; especially now, since science and intelligence have conquered most of the diseases and have made it possible for every one to live in plenty and in happiness and health. This era should be the era of paradise on earth. Mankind has never had the possibilities of happiness that it has now.

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IT WAS the summer of 1918, and the once mighty Imperial Army of Germany, vanquished in its last desperate effort to pierce the ring of steel which the Allied armies had forged along the Western front, was in full retreat. The whining of shells overhead and the rattle of machine-gun fire closer by mingled with the groans and the screams of the wounded and the dying. Disillusioned in that invincibility of German arms which the haughty Kaiser had impressed upon them when he had ordered them on to "victory" over "weak" nations which allowed themselves to be ruled by "democratic mobs," perspiring and frightened men ran cursing toward safety. An unfortunate horse, knowing nothing of the moral and political rights of one-man dictatorship as against popular self-government, lost his footing and went hurtling into a

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deep shell crater; and a kind-hearted soldier stopped momentarily in his headlong flight to put a bullet through the suffering animal's head, wondering, at the same time, whether he himself would be lucky enough to escape a similar fate.

That thought dwelt only fleetingly in the mind of Lieutenant Wiedemann of the Sixteenth Bavarian Infantry, for there was the immediate problem of escaping, if possible, from the merciless gunfire which, with depressing regularity, was moving ever closer. Young and agile, and with a strong disinclination for an early death, Lieutenant Wiedemann scampered after the remnants of his command, but he had barely caught up with his men when a direct hit by an enemy howitzer sent a near-by building crumbling to earth. Buried in the débris was one of the Lieutenant's junior aides, an Austrian-born corporal, who would certainly die an inglorious death without help. So once again Lieutenant Wiedemann interrupted his rearward flight, although the shell fire was now heavier as well as closer.

Corporal Hitler was profuse in his thanks to the superior who had saved him from death. Lieutenant Wiedemann brusquely waved him along, never thinking that his kindly act was some day to lead to a revolution within his own Fatherland and to an even more far-reaching upheaval throughout the world at large. Years later, the memory of that rescue was to come to the Lieutenant with agonizing force. For his name appeared on a "purge" list of those destined for the firing squad which was handed over to Corporal Hitler—now the Führer, with far greater powers than the arrogant Kaiser had ever dreamed of possessing.

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"Fritz Wiedemann?" demanded the dictator. "That name sounds familiar. Who is he?"

Informed that Wiedemann was a war veteran who had become a zealous monarchist bent upon overthrowing the Nazi régime, he ordered him brought to the Chancellery. When the perturbed Wiedemann arrived, Hitler turned to him and, with what was for this extremely cruel and unscrupulous man rare gratitude and generosity, announced:

"Hereafter, you will be my personal aide-de-camp."

The accident of his rescue from death was one of many fortunate events which blind chance, time and again, threw in Hitler's way and led him, an obscure foreigner of lowly origin and without great intellectual attainments, to unquestioned dominance over the German nation. Perhaps it was these fortuitous episodes with which fickle Fortune favored him that inspired Hitler to believe in his own "divinity" and to push with reckless abandon a philosophy of force and hatred which was to disturb violently the peaceful calm in places as far apart as Vienna and London, Moscow and Paris, Washington and the quiet home of Professor Einstein in Berlin's own Haberlandstrasse.

But when Corporal Hitler returned to Munich shortly after the close of the war he was still an obscure and jobless ex-soldier, who had to wear his army uniform because he had no other clothes. It was one of the many strange incongruities of his career that at this period of his life, and for nearly two decades thereafter, he was a man without a country. He had given up his Austrian citizenship when, at the age of 25, he had enlisted in the German army at the outbreak of the war in 1914, and, in spite of

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his fervent and outspoken admiration for Germany, had failed to acquire citizenship in his adopted country. This did not deter him, paradoxically enough, from proclaiming that Germany should be only for Germans of simon-pure native stock, and his fevered racialism was one of the most potent influences in winning him supreme power.

A few months after returning to Munich from the war, this man without a country wandered one day into a beer hall where six men sat around a table sipping beer and discussing politics. They were the entire membership of a German labor party, and when Hitler heard them debating proposed union with Austria he joined the group and heatedly argued that Germany must not soil her pure Teutonic blood with the mixed stock of Austria. The speech was a revelation both to Hitler—who nineteen years later was to force Germany into an *anschluss* with the “impure” Austrians of his native land—and to his audience of six. For it revealed that Hitler had an uncanny oratorical ability which swayed audiences. He was promptly elected propaganda director of the labor group he had joined only a few minutes before, and before long was winning converts by his hectic patriotism and by his demagogic assaults on reparation payments, Jews, democracy, pacifism, and the Treaty of Versailles. So began the National Socialist Labor Party, which later was popularly abbreviated to the Nazi party.

Based on violent prejudices rather than on principles, this organization gained rapidly in influence, as its extreme nationalism attracted many discouraged thousands who were weary of paying for war reparations, of the half-hearted experiment of democracy under the Weimar

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Republic, and of hunger and poverty. The shrinking German intellect welcomed Hitler's teaching that Germany had lost the war only because of the base activities of Jews, Communists and other "traitors"; and, drugged by this fantasy, disheartened Germans became puffed up with a new patriotism and new grandiose dreams of Pan-Germanism. Hitler, who was a strong admirer of Mussolini, dressed his storm troopers in brown shirts in the manner of the black shirts of the Italian Fascists, and by 1923, when he had under his command 10,000 well-disciplined and personally devoted storm troopers, he felt ready to strike for supreme power.

In the fall of that year, on the night of November 9, accompanied by General Erich von Ludendorff, who had become associated with him as second in command, Hitler, his eyelids twitching with unusual excitement, strode to the platform of one of Munich's large beer halls. The place was filled with his adherents and it buzzed with excitement. Whipping a gun out of his pocket, Hitler fired it into the ceiling twice, and, as his storm troopers cheered wildly, announced that the Bavarian Government was dead and he was dictator. The next day, Hitler and Ludendorff marched at the head of 800 Nazis through the heart of Munich toward the former royal palace, firmly intending to take over the Bavarian Government as a preliminary to "the march on Berlin." But to their surprise and chagrin, they found Bavarian soldiers drawn up to oppose them, and when the furtive patriots refused to disperse they were greeted with bullets. The marchers then fled precipitately, and Hitler was captured and tried for treason.

Here Dame Fortune once again smiled kindly on the

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Austrian-born demagogue. The Berlin authorities refused to take the beer-hall putsch seriously, and, instead of demanding the death penalty for the self-styled dictator, as they might have done, they sent Hitler to prison for five years. Germany rocked with laughter at the Nazi uprising which had turned into such a ludicrous failure, and, convinced that Hitlerism had been thoroughly squelched, the authorities released the former Corporal from jail after he had served only eight months of his sentence. But they underestimated the driving force behind the egomania of their prisoner, and within a year of his release Hitler had rebuilt his disintegrated army of Nazis into a more powerful organization than ever before. Thousands listened to him with respect and admiration, as, firmly believing in his own "divine destiny," he proclaimed:

"The man born to be dictator is not pushed forward, but he forges ahead."

By 1928, Hitler, with the aid of several leading German industrialists, had become a national figure and his party won twelve seats in the Reichstag elections. Two years later, he won the first of his great victories; his fortunes soared upward as, in one of the greatest upsets of German politics, the Nazis polled 6,000,000 votes. The tremendous increase in his personal power did not abate his extreme and fanatical doctrines; on the contrary, it gave new vigor to his hatred of Jews, Socialists, democrats, Communists, liberals, and all others who did not agree with a Nazi philosophy which rested on ignorance stimulated by prejudice.

By one of the strangest quirks of fate, the years which saw Hitler's rise to national dominance in Germany

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coincided with the period during which Professor Einstein was winning recognition on an even larger stage as one of the greatest minds of the twentieth century. But the similarity ended there. No two men could have been farther apart in their personal make-up and in their public attitudes than the Professor, who looked like a poet and who ardently desired the end of all violence in the lives of men, and the forceful, autocratic fanatic with the funny mustache to whom might was the only right. Where one was a zealous pacifist, a warm-hearted Jew, a hater of oppression and an advocate of brotherly love and internationalism, the other was daily becoming a more violent militarist, a more extreme Jew-baiter and a more bigoted nationalist who wished to substitute survival of the strongest for rule by law in international affairs.

Hitler had developed his anti-Semitism at an early age. As a boy, before he migrated to Munich, this son of devout Roman Catholic parents frequently visited Vienna's ghetto, and conceived a strong dislike for the people of another religious faith who lived there. This dislike became more intense throughout the years until it was a dominant characteristic of Hitler's personal make-up. In his book *Mein Kampf*, which became the bible of the Nazis, he confessed that his hatred of the Jews was in the nature of unreasoning fanaticism:

"From being a feeble world-citizen I became a fanatical anti-Semite. . . . Thus did I now believe that I must act in the sense of the Almighty Creator; by defending myself against the Jews I am fighting for the Lord's work. The greatness of any active organization which is the embodiment of an idea lies in the spirit of

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religious fanaticism and intolerance in which it attacks all others, being fanatically convinced that it alone is right."

The picture of Professor Einstein, a Jew, winning world-wide recognition as the first citizen of Germany, was galling to this man who, by his own admission, was a "fanatical anti-Semite." And when that Jew was a leader of those forces which were working for pacifism, for better international understanding, for industrial and political democracy—all of which represented doctrines which were anathema to Hitler—the anger of the leader of the German Fascists knew no bounds and he vowed vengeance.

He strode up and down Germany demanding that only pure Germans receive the "noble" privilege of citizenship —(he himself did not obtain citizenship until 1932, when he was about to become Chancellor). He pushed his attacks on the Jews, disarmament, the Versailles Treaty, pacifism and the German Republic with equal abandon, and generally made such a nuisance of himself by his public activity that Chancellor Bruening thought seriously of deporting him as an undesirable alien. But so fantastic were Hitler's national dogmas that no intelligent person could regard him as a serious threat to the German republic, and he was allowed to stay.

While Hitler was spreading the poison of hatred, Einstein, drawn against his own inclinations into the whirlpool of political passions, was giving himself to humanitarian causes, particularly to pacifism and Zionism. It was as an apostle of peace and international co-operation, as a lover of his fellow men who believed that the scars of war could be healed with less nationalism

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and more internationalism, that he appeared frequently at Geneva and on lecture platforms throughout the world. He willingly shouldered the burden of organizing militant pacifist groups; and to men of prominence throughout the world who were out of reach of his voice Einstein—who would not dream of asking anything for himself—wrote pleading letters urging them to throw their influence with his in the scale of peace.

As Europe once again began to take on the appearance of an armed camp, with superheated nationalism reaching out like an octopus over the world to pile up armaments in preparation for another devastating war, Einstein blew ever more loudly through his trumpet of fame to wake the sleeping conscience of mankind. While the instruments of destruction multiplied in the armories of all nations, and the world seemed headed toward another inevitable day of bloody reckoning, Einstein warned that the safeguarding of peace could not be entrusted to politicians and that the common men and women throughout the world must take the cause of pacifism "into their own hands." The interest of peace could not be best served by delegates to peace conferences who were the puppets of "selfish arms manufacturers and ignorant and insincere politicians"; the people should select their own representatives to peace conferences so as to stop the desperate armaments race. Firmly convinced that peace lovers everywhere could preserve peace by becoming articulate, Einstein went so far as to urge that if the workers of the world decided not to manufacture and transport ammunition it would end war for all time!

The armaments industry represented to Einstein "one of the greatest dangers that beset mankind." He believed

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that the powerful industrial groups engaged in the profitable manufacture of arms were doing their best in all countries to prevent a peaceful settlement of international disputes, and were the hidden power behind the fevered nationalism that was rampant everywhere. Although the ruling statesmen in intelligent democracies were doing their best to obtain permanent peace, the ceaseless piling-up of armaments, said Einstein, "shows only too clearly that they are unequal to coping with the hostile forces which are preparing for war." He suggested that the nationalization of war industries might help the cause of peace by curbing the greedy war makers, but in the long run lasting peace could come only from the people themselves.

"As long as armies exist," he warned, "any serious quarrel will lead to war. A pacifism which does not actually try to prevent the nations from arming is and must remain impotent."

Einstein conceded that as long as the possibility of war remained, nations would insist on being as perfectly prepared in a military sense as they could, in order to emerge triumphant from a possible war. He argued, therefore, that piecemeal and gradual disarmament by the nations was neither practical nor desirable, that nations must disarm "at one blow or not at all." The various disarmament conferences, in his opinion, failed to go to the root of the moral issues involved, and the jockeying for position in which the wily delegates engaged was a tragi-comedy which raised doubts as to whether one ought to laugh, weep or hope.

"Imagine," said Einstein, "a city inhabited by fiery-tempered, dishonest and quarrelsome citizens. The con-

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stant danger to life there is felt as a serious handicap which makes all healthy development impossible. The magistrate desires to remedy this abominable state of affairs, although all his counselors and the rest of the citizens insist on continuing to carry daggers in their girdles. After years of preparation the magistrate determines to compromise and raises the question, how long and how sharp the dagger is allowed to be which anyone may carry in his belt when he goes out! As long as knifing is not suppressed by legislation, the courts and the police, things go on in the old way, of course. A definition of the length and the sharpness of the permitted dagger will only help the strongest and most turbulent and leave the weaker at their mercy.

"You will all understand the meaning of this parable. It is true that we have a League of Nations and a Court of Arbitration. But the League is not much more than a meeting-place, and the Court has no means of enforcing its decisions. These institutions provide no security for any country in case of an attack upon it. . . . Unless we can agree to limit the sovereignty of the individual state by binding every one of them to take joint action against any country which openly or secretly resists a judgment of the Court of Arbitration, we shall never get out of a state of universal anarchy and terror."

As the highly developed mechanical and scientific knowledge of mankind was turned more and more toward the creation of engines of destruction, Einstein attacked with renewed vigor those intriguing and unscrupulous politicians who seemed bent on tricking millions of human beings out of their lives and well-being and happiness. To ward off this danger, he was willing to

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adopt extreme measures. He urged others who hated to see the tranquillity of life disturbed by the fury of destruction to fight violence with violence. The best method to combat mounting armaments was the "violent one" of conscientious objection, he declared, explaining that no head of any government would dare to take his country to war if there were a strong will to peace among the people. He argued that "a refusal on conscientious grounds to serve in the army when called up, if carried out by 50,000 men at the same moment, would be irresistible." Einstein admitted that conscientious objection represented an illegal struggle, but he urged it, nevertheless, as the best way to destroy the three great powers of stupidity, fear, and greed which he saw standing behind the machinery of war.

"Only the absolute repudiation of all war is of any use," he emphasized. "We stand at the parting of the ways. Whether we find the way of peace or continue along the old road of brute force, so unworthy of our civilization, depends on ourselves. On one side, freedom of the individual and the security of society beckon to us, on the other slavery for the individual and the annihilation of our civilization threaten us. Our fate will be according to our deserts."

But while the gentle genius was appealing to the conscience of his fellow men, others, as demagogic and ruthless as Einstein was sincere and tolerant, were seeking to betray the human spirit by sowing the seeds of discord and hatred. Einstein's pro-democratic and anti-militaristic speeches and papers inflamed those who hated democracy and pacifism, particularly in Germany, where the spread of the anti-Semitic Nazi movement had created in the

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mind of its leader the firm resolve to establish a Nazi monarchy with himself as the new Kaiser. Playing on the emotions, prejudices and despairs of a large part of the German people, Hitler was gaining new recruits and the life of such men as Einstein was daily becoming more uncomfortable. The growth of anti-pacifism and anti-Semitism was brought home to Einstein one day in an acutely embarrassing manner, when a group of "patriotic" anti-Semitic German students invaded his box at the opera and threatened him with their fists. Even more embarrassing, perhaps, was the outbreak of hostility at—of all places!—a gathering of peace delegates at Geneva to which he had been invited. When Einstein, radiating kindness and flanked by admiring newspaper men and respectful delegates, entered the conference hall, one delegate jumped to his feet and disputed the scientist's right to be present.

"Who sent for him?" he demanded. "What does he represent? Whom does this Jew represent?"

There was an astonished silence. Then the presumptuous objector was angrily hushed down by the other delegates, while an American correspondent, violating the tradition of hard-boiled cynicism which is supposed to govern the behavior of American newspaper men, slapped him across the mouth. Einstein himself gave vent to his mortification upon his return to his hotel when he picked up his violin and made it yell and yowl and screech with weird and horrible discords until his anger evaporated and he was his usual placid and friendly self again.

Nothing was more painful to this man, who had given so much of his life to the fostering of better relations

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among all peoples, than oppression of those men, women and children who belonged to his race. As these attacks increased in frequency and in venom with the spread of Hitlerism, he gave up more and more of his time and energy to the defense of Judaism. Converted to Zionism by leaders of American Jewry who crossed the Atlantic to win him over to their cause, he visited Palestine and lent his name and prestige to the reconstruction of that land as the Jewish homeland. When he was not lecturing on the profound mysteries of Nature, he was talking to audiences in Paris and London and New York about those riddles of human nature which led some unscrupulous men to intrigue, to kill and to bring suffering to their fellow men. His musical voice thundered with an unwonted anger born of pain and compassion as he recalled for the benefit of the intolerant the great contributions of the Jews—as one of the oldest living peoples—to religion, to culture, to the advancement of civilization, and to the ennoblement of the human race. Nobody who retained a shred of sound judgment, he declared, “can deny the Jews respect,” and “no oppression however brutal, no campaign of calumny however subtle will blind those who have eyes to see to the intellectual and moral qualities inherent in this people.” Einstein felt that to be of the Jewish race was a destiny in itself, and he proclaimed to the whole world his pride in being part of it.

He argued with all the strength of his artless, sympathetic and simple soul for mutual toleration and respect. During his visits to the United States he was greatly heartened by the examples of Christian-Jewish amity which he saw, and pointed out that if the same “splendid

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mutual understanding" existed in Europe anti-Semitism would rapidly disappear.

"After all, haven't the differences between Jew and Christian been overexaggerated by fanatics on both sides?" he asked. "We both are living under God's approval, and nurture almost identical spiritual capacities. Jew or Gentile, bond or free, all are God's own. If we do not accept their beliefs, or they ours, in the more detailed, strict sense, this is no reason why we should not strive toward the common goal of all lives: human service.

"There is no higher religion than human service. To work for the common good of man is the greatest creed. At such times of economic and financial depression, Jew and Christian alike suffer. There is no discrimination of blood or souls or religion as to who shall pay the penalty of overproduction or miscalculation. A unified action to fight poverty and starvation is the common responsibility of Jew and Christian.

"We are all on this earth with the same mission of life. The general welfare of mankind is the trust of white man and black, rich and poor, Christian and Jew, Mohammedan and Hindu. Real religion is above petty dogmas, catechisms, solemn prayers and antagonisms. True religion is real living—living with all one's soul, with all one's goodness and righteousness. We Jews should appreciate the profundity of a fellow Jew, the man Jesus. Christians should recognize their close relation to our own religion."

Einstein felt that it was a tragedy of the Jews that they were a people of a definite historical type who lacked the support of a community to keep them together. He believed that just as the want of solid foundations in the

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individual may result in its extremer forms to moral instability, so the lack of a common community tended to dissipate some of the energies of the Jewish race. He concluded, therefore, that the salvation of his race depended upon the creation of a living society to which every Jew in the world could become attached, thus finding aid to endure the hatred and humiliations that he might have to put up with from the rest of the world.

So he became a supporter of the establishment of a national home for the Jews in Palestine, believing that a common enterprise dear to the heart of Jews all over the world would restore the spiritual and social health of Jewry. He pointed out that such a homeland would encourage Jews to become once more conscious of their existence as a nationality and thereby gain for them the self-respect that was necessary to a healthy existence. He urged his co-religionists to learn "to glory in our ancestors and our history and once again take upon ourselves, as a nation, cultural tasks of a sort calculated to strengthen our sense of the community." His conviction that it was not enough for Jews to play a part as individuals in the cultural development of the human race, that Jews must also tackle tasks which only separately organized nations can perform, deepened upon his association with the hardy Jewish colonists during his visit to Palestine.

In this land of many historic memories, Einstein found that his hopes for Jewish colonization and reconstruction were far exceeded by the achievements of the new immigrants. Sir Herbert Samuel, then governor of Palestine, was host to the visiting savant and his wife at the High Commissioner's palace, which once was an estate of Emperor William the Second. Sir Herbert acted as the en-

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thusiastic guide of the Einsteins through that country so rich in Biblical history alike for Judaism, Christianity and Mohammedanism, and introduced them as well to the new Palestine of hard-working, idealistic Jewish pioneers. Much as Professor Einstein was excited by the Wailing Wall, Nazareth, the picturesque mosques, the Sea of Galilee, Herod's Palace, and other historical landmarks, he was even more interested in studying what the united energies of Jewish colonists had accomplished to make the barren land a home for persecuted Jews.

Here, as in all other parts of the world which he had visited, he had to submit to the tiresome ceremonial of fame: of overlong banquets, solemn speech-making, interviews with armies of reporters and photographers and the playing of hide-and-seek with persistent autograph hunters. But he managed to escape from his admirers long enough to visit the Hebrew University, which had grown considerably with the money he had helped to raise by lectures, and the new and prosperous city of Tel Aviv. This new community created by Jewish enterprise, with its well-planned industrial and commercial life, with its new power plant, agricultural station, schools and factories, enthralled Einstein, who saw in it an outstanding example of what intelligence, idealism and cooperation could accomplish even under difficult conditions. Addressing the assembled colonists in their new high school—speaking in French, for he knew no Hebrew—Einstein told the citizens of Tel Aviv that their ceaseless work was supported by a noble purpose, which was leading slowly but surely to a success which would be an inspiration to the whole world.

“For the past two thousand years the common property

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of the Jewish people has consisted entirely of its past," he said. "Scattered over the wide world, our nation possessed nothing in common except its carefully guarded tradition. Individual Jews no doubt produced great work, but it seemed as if the Jewish people as a whole had not the strength left for great collective achievements.

"Now all that is changed. History has set us a great and noble task in the shape of active cooperation in the building up of Palestine. The opportunity is presented to us of setting up centers of civilization which the whole Jewish people can regard as its work. The object which the leaders of Zionism have before their eyes is not a political but a social and cultural one. The community in Palestine must approach the social ideal of our forefathers as it is laid down in the Bible, and at the same time become a seat of modern intellectual life, a spiritual center for the Jews of the whole world."

Both during his stay in Palestine, and thereafter, Einstein lent a hospitable ear to the airing of Jewish-Arab difficulties. In response to a letter from an Arab leader who complained of mistreatment, Professor Einstein emphasized that the difficulties standing in the way of the establishment of satisfactory relations between the Arabs and the Jews were more psychological than real. He declared that if both sides would bring honesty and good will to the task of solving these difficulties, the difficulties would quickly disappear. Giving voice once again to his unshakable faith in arbitration, he urged that a Privy Council be formed, in which the Jews and the Arabs each would have four representatives, to compose the differences between the two races and to engage in an advan-

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tageous partnership which would aid them both as brothers who had to live side by side.

Einstein was not blind to the shortcomings of those members of his race who were in danger of moral disintegration through a life of too much wealth and ease. This "fatty degeneration" bred a contemptible and joyless egoism and consequently was the greatest enemy of the national consciousness and honor of the Jews, in his opinion. He told his people that "the best in man can flourish only when he loses himself in a community"; that all mankind should be guided by the ideal of social justice, voluntary self-denial and joyful service to one's fellow men. The plague of Hitlerism and Jewish persecution would not be an unmixed misfortune, he believed, if it helped to inspire Jews with a new solidarity and mankind as a whole with a higher idealism.

"The weight of outward oppression on the Jewish people is particularly heavy at the moment; but this very bitterness has done us good," he pointed out. "Difficulties and obstacles are a valuable source of health and strength to any society. We Jews should not have survived for thousands of years as a community if our bed had been of roses; of that I am quite sure.

"The position of our scattered Jewish community is a moral barometer for the political world. For what surer index of political morality and respect for justice can there be than the attitude of the nations toward a defenseless minority, whose peculiarity lies in their preservation of an ancient cultural tradition?

"This barometer is low at the present moment, as we are painfully aware from the way we are treated. But it is this very lowness that confirms me in the conviction

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that it is our duty to preserve and consolidate our community. Embedded in the tradition of the Jewish people there is a love of justice and reason which must continue to work for the good of all nations now and in the future. In modern times this tradition has produced Spinoza and Karl Marx.

“How strongly developed this sense of the sanctity of life is in the Jewish people is admirably illustrated by a little remark which Walter Rathenau once made to me in conversation: ‘When a Jew says that he’s going hunting to amuse himself, he lies.’ The Jewish sense of the sanctity of life could not be more simply expressed. . . . In the service of life, sacrifice becomes grace.”

Einstein’s feeling that his life and his rich endowments belonged, at least in part, to his race and to the service of mankind won him the love and homage of countless new admirers. Nothing so quickly and so effectively extends a great man’s fame as his good deeds, and while this gray-headed child, in the true spirit of greatness, never looked upon himself as a great man, the rest of the world came to see in him, more and more, one of the master spirits of the age. Comparatively few understood his scientific achievements, but the whole world was warmed by his self-sacrificing altruism and humanitarianism. Contrary to expectations, including his own, the years after the close of the World War saw, not a diminution, but an increase in the hero worship accorded him. The world insisted upon placing him on a pedestal; indeed, his image appeared side by side with the sculptured likenesses of saints over the entrance to one of the world’s greatest churches; but Einstein remained an abstracted

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sage who was master of the fourth dimension but could not get used to his own renown.

One day he happened to be sitting beside the British Ambassador during a lecture delivered in the Reichstag by H. G. Wells, to whose view of life Einstein felt particularly attracted. When the English historian had concluded his talk, the Ambassador leaned over to the scientist beside him and remarked:

"Professor Einstein, I am proud to have been seated next to you."

The surprised Professor became confused by the unexpected tribute. When he had recovered from his bewilderment, he responded more in the spirit of a pensive soliloquy than in direct reply to the distinguished Briton:

"Isn't it peculiar that I, who have written only unpopular books, should have become such a popular fellow?"

True, Einstein's pacifism and the spread of anti-Semitism made him enemies in some quarters, but this enmity appeared as small, isolated islands which emphasized all the more the otherwise vast, unbroken sea of his fame and popularity. The outburst of amazement and anger which greeted a small group of American women, who had styled themselves the Woman Patriot Corporation, when they sought to bar Einstein's third visit to America in 1932, was enough to send the panic-stricken ladies into storm cellars and to discourage similar attempts in the future. These misguided "patriotic" ladies, whose only distinction was the possession of some ancestor who had been a soldier, resented Einstein's pacifism and liberalism, and they appealed to the State Department to bar him as a Red. Any man who failed to appreciate what to them was the noble heritage of color

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ful uniforms, death-dealing guns and the martial music that was such a welcome relief after too many tiresome rounds of bridge must be "a Communist and a menace to American institutions"! Their petition evoked endless yards of caustic comment from chagrined editorial writers who castigated the petitioners and apologized to the world's first citizen for the "fantastic indignity."

Einstein himself, with his usual tolerance and good humor, disposed of the women's protest with an amicable jest. He was amused, rather than angered, by the attack on him. Instead of emphasizing the obvious fact that he was neither a Communist nor an agitator, but had repeatedly indicated his unalterable opposition to dictatorship and totalitarianism, whether of Communist or Fascist origin, he chose the philosopher's weapon, ridicule.

"Never yet," he said with a grin, "have I experienced from the fair sex such energetic rejection of all advances; or if I have, never from so many at once.

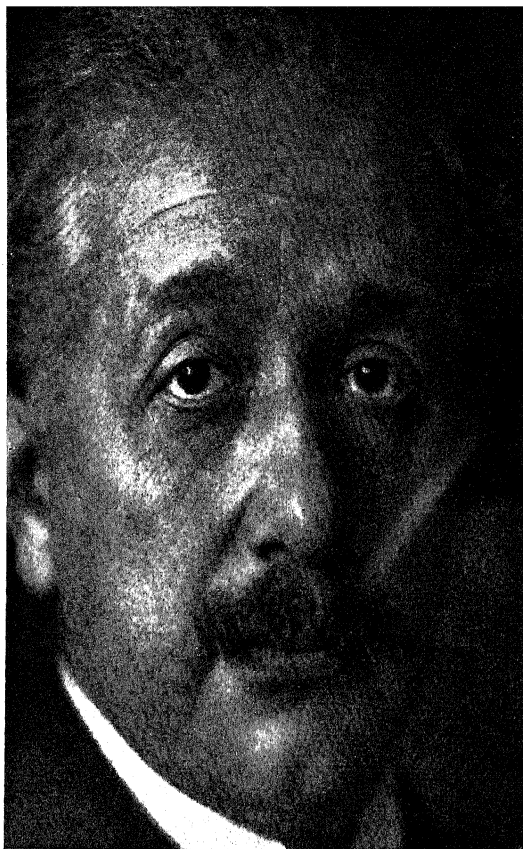
"But are they not quite right, these watchful citizenesses? Why should one open one's doors to a person who devours hard-boiled capitalists with as much appetite and gusto as the Cretan Minotaur in days gone by devoured luscious Greek maidens, and, on top of that, is low down enough to reject every sort of war, except the unavoidable war with one's own wife?

"Therefore give heed to your clever and patriotic women-folk and remember that the capital of mighty Rome was once saved by the cackling of its faithful geese."

Einstein assumed that no serious notice would be taken of the women's petition, but subsequent events proved that his opinion of the intelligence of government officials was too high. For some mysterious reason, Secretary of



AN EAGER STUDENT LEARNS FROM A MASTER



THE FACE OF A POET—AND THE MIND OF A SCIENTIST

A gentle genius saddened by war, anti-Semitism, oppression and the absence
of that peace and brotherhood which he ardently craves

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State Stimson saw fit to forward the women's protest to the American consular offices in Berlin. The Consul General was away and one of his subordinates solemnly informed Professor Einstein—who had consented to return to America only after numerous pleading letters had begged him for another visit—that he would have to be subjected to an examination for a visa “permitting” him to go to the United States.

The world's most famous scientist was perplexed by the consular summons. In the past, all arrangements for his trips, including all formalities, had been arranged for him by others, usually by officials of shipping lines. Always tolerant of human error, the Professor, accompanied by his ever-watchful wife, appeared at the consular office, where the officious underling who was temporarily in charge proceeded to conduct an inquisition of the visitor.

“What is your political creed?” was the first question.

Professor Einstein stared blankly at his interrogator and then burst out laughing.

“Well,” he said after some hard thinking, “I’m afraid I don’t know. I can’t answer that question.”

“Are you a member of any organization?” the inquisitor proceeded.

Professor Einstein ran his hand through his bushy gray hair, turning to his wife for assistance. Then, as if an inspiration had just come to him, he exclaimed with obvious relief:

“Oh, yes! I am a War Resister.”

“Who are they?” was the next question.

“Well,” said Einstein with that innocent bewilderment which frequently characterized his contact with the commonplaces of life, “they are my friends.”

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"What is the purpose of your visit to the United States?" the ill-informed examiner persisted.

The answer to that one came with ease and promptness—"to do some scientific work." But as the schoolboy questioning continued, Einstein, mindful of the work waiting for him in his tower study, became more and more impatient with the trivial queries. He suspected that he was the victim of a practical joke, and waived aside one particularly silly question with the comment: "Are you trying to kid me?" Then picking up his hat and coat he and the indignant Mrs. Einstein strode out of the presence of the officious consul. A half hour later, a telephone message from the Einstein apartment informed the confused official that the Professor would submit to no further interrogation and that unless a visa were available by the following morning the Einsteins would not visit America.

Meanwhile, newspapers throughout the world, particularly in the United States, were bitterly condemning officious ignoramuses in office and out who were making Americans a laughingstock, and were offering Einstein sympathy and apology. The cables between Berlin and Washington burned during the night, and the following day—several hours before Einstein's ultimatum was to expire—the Professor received his visa, together with an avalanche of cablegrams from America urging him to overlook "those old ladies" and "officious ignoramuses" and to "come to America and forgive us our trespasses." Einstein, with his usual superiority to incidents of only passing importance, had fully recovered his good humor and laughed at the whole affair as a joke. "Ach, Elsa," he said to his wife with a twinkle in his dark eyes, "here

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I have two honorary keys to the City of New York and it looks as if they would not give me a chance to use even one of them." Four days later he was aboard the steamship *Oakland*, bound for California for another conference with American scientists, and the enthusiastic reception given him upon his arrival removed any lingering doubt as to his welcome in the United States. As if to make up for some of the shortcomings of the ignorant few among the fair sex, women were particularly numerous in the throngs that turned out to greet the distinguished visitor.

It was with a light heart that Einstein landed in California to resume in collaboration with American scientists his efforts to pry open a few more pages of the sealed book of Nature. His oft-repeated prediction that Hitlerism was merely a passing symptom of post-war resentment and misery—a symptom that would vanish with the return of sanity to the misguided youth of Germany—appeared to be borne out by the latest developments in his homeland. President von Hindenburg had steadfastly refused Hitler's demand to be made dictator, and in the Reichstag election of November 6, 1932—a fortnight before Einstein's departure for the United States—there had been a sharp drop in the Nazi vote and a corresponding increase in the vote of the opposition. The star of the shrill-voiced Hitler, who had reached his peak in the spring elections of 1932, when he had entered the presidential campaign against the venerable von Hindenburg and had received 13,000,000 votes against the President's 19,000,000, appeared definitely on the wane. The whole world breathed more easily, and Professor Einstein cheerfully declared that with the return of the German people

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to "the road to clarity" anti-Semitism in Germany would pass away, just as the anti-Semitism engendered in France by the Dreyfus affair had disappeared. But history took a different turn.

On the blustery night of February 27, 1933, while the Einsteins were busy with last-minute farewells and packing prior to their departure from California for the long trek back to Germany, an astonished Berlin policeman noticed a tongue of flame shooting from the historic Reichstag building. This center of the political life of the infant German Republic was soon blazing away furiously, while thousands of indignant and patriotic Germans looked on, wondering who was guilty of setting the fire and vowing vengeance upon the perpetrator. Not the least interested in the throng that watched the sputtering flames devour the curtains and every other inflammable object as they swept by the statue of Kaiser Wilhelm I on their way to the glass roof were three men who stood to one side in the dim light caused by the fire.

Neither Captain Goering, nor Dr. Goebbels nor Herr Hitler had the least doubt as to who had caused the fire—as indeed who should have known better than the conspirators who had hatched the plot and who had directed its execution from the home of Captain Goering next door to the Reichstag? But it was a perversion of the truth that the tricky trio vouchsafed to the throng. Hitler sternly informed interested bystanders that "this is a God-given signal!" (Perhaps the slight confusion in his mind which frequently led him to identify himself with the Divinity helped to justify this statement to himself!) "If this fire, as I believe," he cried, "turns out to be the handiwork of Communists, then there is nothing that

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shall stop us from crushing out this murder pest with an iron fist." No one in that crowd seemed able to question the strange processes of the Hitler mind, even when confronted by the amazing behavior of the leader of the Communist Party, who, when informed of the fire while at supper in a public restaurant, had failed to respond to the "signal" by leaping to revolutionary action, as he was supposed to do, but, instead, had jumped into a street-car and gone to the scene of the fire as any other interested Berliner might have done!

But logic never bothered Hitler. If the Communists and the other anti-Nazis failed to respond to the "signal" for uprising against the Republic, he would not be so negligent. The six days which intervened between the Reichstag fire and the general election of March 5, 1933—an election which, prior to the conflagration, had promised to diminish Nazi strength and increase the representation of other parties in the doomed building—were spent by Hitler in a campaign of unprecedented attacks on Socialists, Communists, Catholics, Jews, and other groups hostile to the Nazis. A new epoch in German history was about to be born, he proclaimed. And, unfortunately, he was right. With that amazing good fortune which saw him again and again rise spectacularly to new peaks in his incredible career just when a devastating defeat seemed to be the order of the day, Hitler used the ashes of the Reichstag to resurrect his power, much like the fabled phenix of old. The sudden shock of that fire sent the half-terrorized German populace to the polls with a mandate to Hitler and the Nazis to save them from anything and anybody they saw fit. Hitler's supreme authority was born that day, and with it was born also

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a reign of terror, featured by concentration camps to which Republicans, Socialists, Catholics, pacifists and all others who doubted Hitler's divine mission were sent to be "Nazified."

This startling news reached Professor Einstein upon his arrival in New York City, after an overland journey from California to attend a dinner at which the mayor of the city and the governor of the State headed more than one thousand scientists, diplomats, educators, leaders of Jewry and the representatives of the world of art, literature and jurisprudence, in a parting tribute to the distinguished visitor prior to his sailing for home. Saddened and disillusioned, Einstein announced that he would not again put foot on German soil while it was under Fascist tyranny. In a manifesto of simple words, which echoed throughout the civilized world like a blare of trumpets, he reiterated his love for peace, freedom and democracy and his undying distaste for the "psychic distemper" which had gripped Germany:

"As long as I have any choice, I will stay only in a country where political liberty, toleration, and equality of all citizens before the law are the rule. Political liberty implies liberty to express one's political opinions orally and in writing, and a tolerant respect for any and every individual opinion.

"These conditions do not obtain in Germany at the present time. Those who have done most for the cause of international understanding, among them some of the leading artists, are being persecuted there.

"Any social organism can become psychically distempered just as any individual can, especially in times of difficulty. Nations usually survive these distempers. I

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hope that healthy conditions will soon supervene in Germany and that in future her great men like Kant and Goethe will not merely be commemorated from time to time but that the principles which they inculcated will also prevail in public life and in the general consciousness."

Emissaries of the German Government sought so to soften Einstein's attitude and to induce him to return to Berlin. But much as he longed for his homey flat in Haberlandstrasse and the quiet and picturesque security of Caputh, he gave a deaf ear to all such pleas. His original plans had called for his sailing for Germany immediately following the New York dinner, but he canceled his booking and remained in New York City a few days longer. When he did leave America, his destination was not Germany, but Le Coq-sur-Mer, Belgium.

When Professor Einstein arrived in that pleasant seaside village to spend the first few months of his exile, he discovered that the "psychic distemper" of Germany had grown to enormous proportions. With Hitler standing sentinel over the mind and heart of Germany to keep them vacant of all thoughts and feelings save those of fear and hatred, that nation unloosed a reign of terrorism and oppression such as the modern world had never seen. And the greatest mind since Newton did not escape this persecution. Angered by Einstein's uncompromising refusal to heed pleas for his return to Germany, the Nazis forced members of his household, including his two stepdaughters, to flee to Holland. A Nazi organization placed a price of 20,000 marks, then worth about \$5,000, on his head, offering the reward to anyone who would "silence" the immortal discoverer of relativity. Nazi philologists

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brought out a new German Encyclopedia in which not only was "Christian honor," with intriguing frankness, called "in strict contradiction with the Germanic conception of love and honor," but a new philosophy was also offered on matrimony, heredity, politics, Aryanism and relativity. Einstein's famed theory, which previous editions of the Encyclopedia had described as one of the monumental achievements in the history of science and a landmark in human thought and German culture, suddenly lost all its importance. The Nazi men of learning warned Germans to disregard the "so-called theory of relativity, which attracted much attention because of the strong propaganda in the Jewish press," and its discoverer, with equal objectivity, was called "a participant in all salon Bolshevik activity."

Nor did Germany's foremost scientists and learned bodies escape from the unreasoning prejudice and the warped mental processes which became characteristic of the fateful era of the Hitler monarchy. Einstein, in exile, had given up his German citizenship and his membership in the Prussian Academy of Science, owing to his inability "to continue to serve the Prussian State under its present government." The Academy, which had so enthusiastically welcomed Einstein as a young genius in 1914, now accepted his resignation with the statement that it had "no reason to regret Professor Einstein's retirement." Indeed, in a statement broadcast jubilantly by the German press, the Academy "indignantly" accused Einstein of so-called "atrocious" propaganda.

"The Prussian Academy of Sciences is particularly distressed," ran the quixotic statement, "by Einstein's activities as an agitator in foreign countries, as it and its

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members have always felt themselves bound by the closest ties to the Prussian State and, while abstaining strictly from all political partisanship, have always stressed and remained faithful to the national idea."

Einstein, for whom the intellectual comradeship of other scientists was one of his greatest joys, was deeply hurt by this official attitude of men with whom he had had the closest associations for nearly twenty years. At first he was inclined to overlook the Academy's action, consoling himself with the knowledge that it was due in large part to external pressure from those who had gained rule over Germany. But mounting anger over continued attacks on him in the German press as an agitator led him, under date of April 5, 1933, to reply to the Academy from Le Coq-sur-Mer with a letter accusing it of publicly slandering him.

"I hereby declare that I have never taken part in atrocity-mongering, and I must add that I have seen nothing of any such mongering anywhere," he wrote. "In general people have contended themselves with reproducing and commenting on the official statements and orders of responsible members of the German Government, together with the program for the annihilation of the German Jews by economic methods. . . . The German press has reproduced a deliberately distorted version of my words, as indeed was only to be expected with the press muzzled as it is today. I am ready to stand by every word I have published. In return, I expect the Academy to communicate this statement of mine to its members and also to the German public before which I have been slandered, especially as it has itself had a hand in slandering me before that public."

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But the mental processes of the Academicians, like those of many of their countrymen who were less fortunate in their scholarship, were enslaved by prejudice. Einstein's world renown had been a sore point with many of his envious German colleagues, and now they were able to give voice to that envy under the guise of patriotism. A few of the members felt that the Academy's official treatment of one of its former members was a great tragedy, but most of these, in self-preservation, kept silent, while those who were more courageous were quickly drowned out by their super-nationalistic colleagues. The Academy refused to withdraw its accusation. Instead, under date of April 7, it wrote Einstein again, "deploring" that he had failed "in his duty as one of the senior members of the Academy" to counteract the "unjustified" statements in other countries against the new Germany. The Academy lectured him for having made speeches which, "coming from a man of world-wide reputation, were bound to be exploited and abused by the enemies not merely of the present German Government but of the whole German people," and in its denunciatory letter—which it generously made available to the German newspapers—took this defamatory attitude:

"While the Academy profoundly regrets the turn events have taken, this regret is inspired by the thought that a man of the highest scientific authority, whom many years of work among Germans and many years of membership in our society must have made familiar with the German character and German habits of thought, should have chosen this moment to associate himself with a body of people abroad who—partly no doubt through ignorance of actual conditions and events—have done

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much damage to our German people by disseminating erroneous views and unfounded rumors.

"We had confidently expected that one who had belonged to our Academy for so long would have ranged himself, irrespective of his own political sympathies, on the side of the defenders of our nation against the flood of lies which has been let loose upon it. In these days of mud-slinging, some of it vile, some of it ridiculous, a good word for the German people from you in particular might have produced a great effect, especially abroad.

"Instead of which your testimony has served as a handle to the enemies not merely of the present Government but of the German people. This has come as a bitter and grievous disappointment to us, which would no doubt have led inevitably to a parting of the ways, even if we had not received your resignation."

The letter convinced Einstein that under current conditions it was impossible to press the daylight of reason into the blackness of prejudice which enshrouded the Academy. He decided to bring the futile exchange of correspondence to an end, and a few days after the Academy's caustic epistle had arrived at his little seaside haven, he penned (April 12) this calm but firm farewell:

"I have received your communication of the 7th instant and deeply deplore the mental attitude displayed in it.

"As regards the fact, I can only reply as follows: what you say about my behavior is, at bottom, merely another form of the statement you have already published, in which you accuse me of having taken part in atrocity-mongering against the German nation. I have already,

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in my last letter, characterized this accusation as slanderous.

"You have also remarked that a 'good word' on my part for 'the German people' would have produced a great effect abroad. For this I must reply that such testimony as you suggest would have been equivalent to a repudiation of all those notions of justice and liberty for which I have stood all my life. Such testimony would not be, as you put it, a good word for the German nation: on the contrary, it would only have helped the cause of those who are seeking to undermine the ideas and principles which have won for the German nation a place of honor in the civilized world. By giving such testimony in the present circumstances I should have been contributing, even if only indirectly, to the barbarization of manners and the destruction of all existing cultural values.

"It was for this reason that I have felt compelled to resign from the Academy, and your letter only shows me how right I was to do so."

While this correspondence was in progress, a group of Nazi storm troopers, fully equipped with machine guns and other weapons for their self-protection, conducted one of the most perfect raids in history. The object of the raid was the Einstein summer home at Caputh. The Nazis charged that a huge quantity of arms and ammunition was stored in the secluded cottage set amid pine trees on the banks of the Havel. Moving stealthily, the courageous men in brown completely surrounded their objective and then, in full force, descended upon it. They searched the Einstein "arsenal" from cellar to roof and

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then gathered in the living room with their spoils—a single bread knife, slightly rusty from long disuse!

But that was sufficient evidence to convict Einstein of treason against the German nation! Not only was the scientist's summer home—which the city of Berlin four years earlier had tried so extravagantly and so vainly to give to him as a birthday present—confiscated, but so were all the Professor's securities and funds, amounting to about 25,000 marks, "to prevent their use for treasonable purposes."

Meanwhile, threats against Einstein's life caused Belgian police to guard his temporary home at Le Coq-sur-Mer day and night. Nearly all of Scotland Yard turned out to guard him as, defying warnings that he would be assassinated if he kept the appointment, the Professor appeared in London to urge 10,000 persons filling Albert Hall to fight against brutality and barbarism and for liberty and honor. Einstein's speech, which launched a drive for \$5,000,000 to aid German refugees, was his first public appearance since the Nazi revolution. Surrounded by some of the greatest men of science, literature and public life in Great Britain, he affirmed his philosophy of human destiny.

"Every now and then," he declared, "the world is moved by some catastrophe of nature, some earthquake which has ravaged a city or flood which has poured through a populous valley. Today we are faced with something worse—a catastrophe produced by an act of man.

"In the lightning flashes of our tempestuous times one sees human beings and things in their nakedness. All nations and all human beings reveal clearly their aims,

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powers and weaknesses, and also their passions. Routine becomes of no avail under the swift change of conditions, and conventions fall away like dry husks.

“Men in their distress begin to think about the failure of economic practice and about the necessity of political combinations which are supernatural. Only through perils and upheavals can nations be brought to further developments. May the present upheavals lead to a better world. Above and beyond this valuation of our time, we have this further duty to care for what is eternal and highest among our possessions—that which gives life its import and which we wish to hand on to our children purer and richer than we received it from our forebears.”

A homeless exile, Professor Einstein was flooded with invitations from friendly countries to make his home with them. Spain, which under Isabella and Ferdinand had expelled the Jews in 1492, now in a new burst of tolerance by the infant Spanish Republic invited the world's foremost Jew to take a chair at the University of Madrid. France offered to create a special professorship of physics and mathematics at the Collège de France for the exile, while England offered him British citizenship. But when Einstein finally selected a place for the remaining years of his life he turned to the country which had received him with so much kindness and “undeserved respect” and where he had found the flowers of liberty and democracy in their best bloom; and so, like millions of other wandering refugees before him, he became an emigrant bound for America.

VIII

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Everything that the human race has done and thought is concerned with the satisfaction of deeply felt needs and the assuagement of pain. One has to keep this constantly in mind if one wishes to understand spiritual movements and their development. Feeling and desire are the motive force behind all human endeavor and human creation, in however exalted a guise the latter may present itself to us.

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AN ELDERLY man in a wing collar, a dark suit and overcoat and a black, broad-brimmed hat stood at the end of a Southampton pier, his steady gaze turned pensively toward a small liner bound from Antwerp to New York which had dropped anchor about a mile off-shore. A gust of wind caught his long, silvery hair and brushed it against his softly wrinkled face, but he gave no heed as he watched a tender pull out from the ship and head toward the shore. His dark eyes on the gently swelling sea and his mind lost in reverie, he was wholly oblivious of the British secret service men who were there to guard him and who watched him as intently as he watched the steamer *Westernland's* tender which now was drawing alongside the pier.

There was a sigh of relief from the Scotland Yard agents

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as, their duties discharged, they saw the tender turn about and head once more toward the *Westernland*, which was now rolling clouds of black smoke into the blue sky as a sign that it was eager to resume its journey. Within a few minutes, the meditative man in black was climbing the ship's gangplank with a step which seemed to drag a bit, not so much from age as with fatigue and sadness. Under one arm he clutched a violin in a manner which indicated to the more sensitive passengers who lined the ship's rail that this was more than a musical instrument to the traveler who was joining them, that it represented a precious companion capable of yielding friendship and joy and healing balm to the mind and spirit of its owner, who looked, indeed, as if he were in need of considerable spiritual stimulation.

That the diffident newcomer was a refugee, and that the violin which he hugged so closely, as a child might clasp a cherished doll, was almost the sole material possession of value left to him, few realized until he turned over to the ship's deferential officers his traveling papers. His tickets called for quarters in the tourist class. Those fellow passengers who recognized their distinguished companion marveled that a man who had been feted by kings and emperors and financial tycoons could be so unconcerned about such modest accommodations on so small a boat. As the ship's whistles sounded farewell to England and the start of the journey across the Atlantic, the newcomer could be heard playing a Bach concerto on his violin in his small cabin.

A week later, he stood on the steps of a small red brick and limestone building in Gothic architecture on the edge of Princeton University's campus, sniffing the pleas-



Wide World Photos

EINSTEIN WITH A GROUP OF MUSICAL FRIENDS

Left to Right, Front Row—Ossijs Giskin, Toscha Seidel, Dr. Einstein, Bernard Oeko, Back Row—Mrs. Toscha Seidel, Mrs. Albert Einstein, Emil Hilb. A Musical Evening at the Scientist's Home, 112 Mercer Street, Princeton, New Jersey



THE PROFESSOR'S STEPDAUGHTER MARGOT
WITH THE PET OF THE HOUSEHOLD



THE LATE MRS. EINSTEIN AT HER HOME
IN PRINCETON, NEW JERSEY

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ant aromas of autumn. Excited birds migrating southward chattered in the trees, smoke curled pleasantly from a near-by bonfire of fallen leaves, and a group of hatless students, lost in animated discussion of Princeton's chances against Columbia in Saturday's football game, walked by on the way to classes.

The soft, inquisitive eyes under the halo of white hair smiled in enjoyment of the scene. Nature in her loveliness never failed to stir this strange son of hers, and Professor Einstein lost that unpleasant feeling of being a fugitive, a stranger in a new and alien world, as he drank in the tingling air of October and the friendly atmosphere of America. His nomadic existence of recent months was over. He was at journey's end. What if he had been shorn of the domestic and academic associations of a lifetime by the ruthless scythe of Nazism? Nature smiled with the same kindness and joy on her children everywhere, and here in America, where his misfortunes had inspired added friendship and respect, he would make new intellectual associates as he searched for clues to the everlasting riddles of the universe. There was a new jauntiness in his step, born of that resolute courage which had led him to attack alone the accepted scientific beliefs of centuries, as he turned and passed into Fine Hall and up to room 215 which the bulletin board listed as the office of "A. Einstein."

Fine Hall was acquired as its temporary quarters by the Institute for Advanced Study shortly after it was founded in 1930 with a \$5,000,000 endowment by Louis Bamberger and his sister, Mrs. Felix Fuld, former owners of a Newark department store. The Institute consisted of a group of distinguished scholars who were subsidized so

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that they might pursue their own researches without distraction of conducting classes. When Professor Einstein joined this unique organization he found gathered, under the direction Dr. Abraham Flexner, some of the foremost mathematicians in the world. The faculty consisted of five professors, including Einstein, one associate and three assistants. There were only twenty students, all doing special work in mathematical research. As Professor of Mathematical and Theoretical Physics, Einstein conferred with these students at such times as his advice and guidance was sought in dealing with particularly difficult investigations. He mingled, too, with the informal group, which sometimes numbered as many as sixty or seventy savants, who gathered occasionally in the "common room" of Fine Hall for tea and for informal discussion of problems in mathematics and physics. Against the background of a large, handsome fireplace, over which was engraved the legend "God is clever, but not dishonest," taken from one of Einstein's speeches, the shy newcomer, whom all looked upon as Newton's regal successor, moved about in the distinguished throng—which frequently included visiting scholars from the leading American and European universities—always eager to receive as well as to impart knowledge.

When the Institute was organized, and Professor Einstein consented to become a member of it, the ticklish question of salary had to be settled. The trustees asked him to indicate the salary he would like to have. Upon receipt of his reply from Europe, there was general consternation, and a hasty meeting of the board was held. The trustees were considerably embarrassed. They finally drafted an answer informing him that his figure was out

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of the question. Institute standards had to be considered. They were, therefore, taking the liberty of modifying his request and had fixed his salary at a more "appropriate" sum—which happened to be three times greater than the one Einstein had named.

For a long time after the scientist's arrival in Princeton the academicians in the Institute's community also recalled with a chuckle the memorable occasion of his first lecture. The attentive and deferential group listened to every word until Einstein reached the end of his manuscript. Then the Professor looked up and smiled joyously at the roomful of learned teachers who had become pupils for the nonce, to indicate that he had enjoyed the pleasant session as much as they had. His listeners expected him to bow and withdraw, in the customary manner of American lecturers, but, never a strict adherent of convention, Einstein remained upon the rostrum, still smiling expectantly. He appeared to be waiting for somebody to do or to say something to continue the happy occasion. But no one among the convention-bound Americans knew what to do. The silence became painful to everyone except to Einstein. He was still on his feet, smiling happily. He could explore the limits of the universe, but he did not quite know how to end his maiden speech as an American academician! Then someone broke the silence by applauding, and the whole roomful of bewildered scholars forgot conventional procedure to do likewise. Becoming conscious of the thunderous applause, Einstein accepted it as a signal that the lecture was over and, nodding his head cheerfully at his gently amused colleagues, he withdrew from the platform.

For his home, Einstein chose a modest two-story gray

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frame house at 112 Mercer Street, a quiet narrow thoroughfare shaded by tall oak and elm trees into which few of Princeton's 7000 inhabitants wandered. The Professor chose his American abode principally because of its high ceilings and the extensive flower gardens which he could see from his study. He settled down with Mrs. Einstein and his stepdaughter Margot to a placid and contented life, devoting his mornings to consultations with one of his assistants from the Institute and his afternoons to his office in Fine Hall. He loved to spend much of his leisure in the hammock stretched on the veranda of his new home, dreaming of new ways to take the pulse of Nature, while the tumultuous flowering shrubs about the house protected him from the curiosity of anyone who might wander into the shadowy little street.

Sometimes when a meditative mood gripped him Einstein's normally tranquil existence would be disrupted and no one knew where to find him. He would come and go like the wind, as inspiration decreed, and at such times hours meant nothing to him. He might go for a long solitary hike, or amuse himself by balancing himself on an abandoned railroad track out on the level green meadows about Princeton while his mind was lost in reverie where no one could accompany him. Tired but happy if his self-communing had yielded some new clue to one of the cosmic riddles that bothered him, he frequently stopped at the Princeton Inn on his way back to the university town for his favorite dish of mushrooms and stuffed pike.

On one such occasion, a visitor to Fine Hall found three distinguished middle-aged professors asleep in leather chairs in the lounge. He hated to disturb their

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afternoon nap, but he was in Princeton for a short time only and he wanted to see Professor Einstein before leaving. He hesitantly approached the dozing academicians and inquired the whereabouts of the scientist.

"Where, indeed, is Professor Einstein?" chorused the three savants, as they sat up and blinked at the newcomer through their pince-nez. "We're looking for him ourselves. His office is in room 215, but he's not there and no one knows where he is. If *you* can find him, we shall be very grateful!"

So the newcomer joined the trio of patient professors, and ensconced himself in one of Fine Hall's comfortable armchairs. But the coming of twilight still showed no sign of the errant scientist, and the disappointed quartet departed sadly through the cathedral-stillness of the linoleum-carpeted corridors to the outdoors where the early evening stars were shining in a beautifully clear sky. Miles away, a solitary, hatless man stood leaning against a tree, his white hair blowing in the breeze like a halo about his head, enthralled by the same majestic spectacle of the blue quietness above with its eternal beauty and mystery. It was dark and it was chilly, but Professor Einstein did not mind; for a new spark had ignited the fires of his genius and he felt a comforting warmth in his veins as he turned and trod rapidly homewards, eager to set his new ideas down into those mathematical formulae which were to him more beautiful and satisfying than the finest works of art.

With the passing of time, the hurts which he had suffered at the hands of Hitlerism in his native land faded into the background of his mind and he found a new and a more vital happiness in America. The tolerance, the

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idealism, the sympathy and sense of justice of Americans kindled his own sympathies, and he confessed to Mrs. Einstein that the combination of ideal working conditions and friendly, understanding neighbors made him feel happier in America than he had ever felt anywhere else on earth. He still preferred walking to riding in an automobile and would not own a motor car; but he did succumb to another American mania and installed a radio in his home. He derived a great deal of enjoyment from his radio, especially in listening to symphonies and operatic concerts. At those times when the ether waves seemed to purvey nothing but hectic jazz and the noisy antics of vaudevillians, he would remark with a sly smile that the radio had one great advantage over real life—"you can turn it off any time you want to"—and promptly suited his action to his words. Professor Einstein became very friendly with his colleagues at the Institute and with many of the faculty members at Princeton University, several of whom were refugees like himself; and some of his most delightful relaxations consisted of small parties where he gathered with these men to discuss science and the turbulent state of the world. Mrs. Einstein also found it not too difficult to induce him to leave his comfortable home for a concert, and once in a long while she even succeeded in persuading him to accompany her to a motion-picture theater.

Einstein's kindliness, naturalness and human understanding, that rare combination of greatness and goodness, soon made him a well-known and popular figure throughout Princeton's little community. University students who were scions of wealthy and prominent families, as well as the humble Greek restaurant keeper and the

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Italian barber along Nassau Street, felt that remarkable magnetism which he radiated. When he strode through the village of Princeton dressed in old clothes of indifferent style, and trailing clouds of tobacco smoke from his ever-present pipe, the village merchants and university students stood and watched him go by in awed wonder. Einstein's appearance was a signal for the local tradesmen to emerge from their shops, to smile at the "great Professor," and to win a friendly wave of the famous pipe and a "Hi!" in response. The Greek restaurant man screwed up his courage one day and asked Einstein what lay outside the known universe. The scientist grinned broadly and then replied with a chuckle: "Ja, do not worry; you don't go out there!"

What attracted the students and the townsfolk to Einstein most of all was his artless, unfettered unconventionality. They remarked that the Professor apparently was fond of walking in the rain, and they watched him with friendly amusement as he strode by without an umbrella, raincoat, hat or rubbers on wet days when he had managed somehow to escape Mrs. Einstein's ministering surveillance. One rainy day, the Professor was not even wearing shoes. Clad in carpet slippers, he went slip-slapping along, the rain running down the side of his nose, his pipe smoking away and his mind happily preoccupied with some new mathematical equations which he had evolved that morning. On warmer days, he sometimes put a hand in his pocket and, instead of extracting some mysterious bit of universal phenomena therefrom, as Princeton's citizens half expected him to do, pulled out a nickel. With this coin he marched into the corner drug-store, to emerge two minutes later with a smile and an ice-cream cone

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which he licked with an amazingly red tongue and child-like relish as he resumed his walk. Einstein's unabashed unconventionality and simple naturalness caused some of the more staid dignitaries of the Princeton campus to raise gray eyebrows in flabbergasted surprise. A professor, a world-famous professor at that, eating an ice-cream cone like any common urchin on historic Nassau Street! But Einstein was unaware of the embarrassment he had caused some of his colleagues, and even if he had been, he would not have cared. What if George Washington, James Madison, Grover Cleveland and Woodrow Wilson had all trod Nassau Street and not one of them had been seen eating ice cream? Einstein liked ice cream, and if his eating an ice-cream cone meant a violation of hoary tradition, a mind which had overthrown the scientific traditions of centuries and remade mankind's concept of the universe was not likely to be disturbed by that fact.

This naïve simplicity which knew no pose or pretense endeared him to the students, who, like himself, had a wholesome disregard for the tyranny of custom. They voted him "a regular guy," which to their mind was the highest praise. Along about the time that the Class of '37, whose members had matriculated at Princeton the same month that Professor Einstein had arrived there as a refugee from Nazi persecution, was ready to graduate, all of Princeton regarded the scientist as a great and beloved personality who was as much a part of the community as ancient Nassau Hall, the Princeton Inn or Palmer Stadium. The Class of '37 took special and public cognizance of this truth when it assembled on the steps of Nassau Hall to sing farewell to college life, and in

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the somewhat irreverent attitude typical of collegians proclaimed:

The bright boys, they all study math
And Albie Einstein points the path.
Although he seldom takes the air,
We wish to God he'd cut his hair.

But that was only a song, in the serio-comic spirit of a departing college graduate. The cutting of a single lock from the lion-like mane of silvery hair which crowned the dark brown eyes and bushy eyebrows of Princeton's foremost citizen would have outraged no one more than the flippant students.

But if the students and the faculty and the townsfolk of Princeton, and Americans in general, readily adopted Einstein as one of their own and regarded him as a naturalized American by virtue of his simplicity, warm-heartedness and greatness of mind and spirit, the scientist himself was no less enthusiastic in his adoption of America. He looked upon America as "an extremely fortunate land," superior not only in its vast national resources but also in the creative capacity and joyous attitude toward life of its people. He admired Americans because they were "friendly, confident, optimistic and without envy," and he found intercourse with them easy and agreeable. Compared with the American, the European, in Einstein's opinion, was inclined to be more self-conscious, less good-hearted and helpful, more isolated, and generally more of a pessimist. But above all else, he admired the idealism and the highly developed social sense which inspired Americans to recognize community responsibility toward

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the less fortunate and to support generously cultural and scientific undertakings.

"America is usually decried as a particularly materialistic country, but my experience teaches me that the idealistic attitude and the appreciation of knowledge and justice is especially prevalent here," he told his new friends. "I work here under the best imaginable working conditions, and I have never been so happy. I would rather live here than anywhere else in the world."

So Albert Einstein resolved to become an American. And on January 15, 1936, he appeared at the Mercer County courthouse in Trenton a little before noon. A cold drizzle was falling, and a man more mindful of personal comforts would have picked a more pleasant day to put his resolution into effect. So it was with considerable surprise that the attendant at the courthouse looked up to see a damp, aging man with a shock of white hair standing before him.

"Are you the citizenship papers clerk?" the visitor asked courteously.

He was informed that the person he wanted to see was at the post office on East State Street, about a mile away. And, added the attendant with a thought for the inclement weather and his visitor's age, the citizenship clerk was available to visitors on any day during the week. Professor Einstein thanked the attendant profusely; then, bareheaded, he walked the mile in the rain to the post office. It was a thoroughly drenched, but, nevertheless, happy man who presented \$2.50 at the Naturalization Bureau and received in return his first citizenship papers.

The five years that had intervened between Einstein's triumphant visit to America late in 1930 and his decision

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to become an American had seen vast changes, not only throughout the world but also in his own appearance and outlook. American friends who had known him well noticed that the Professor Einstein of Princeton had none of the boyish and joyous characteristics which had marked his expression, coloring, gestures and gait a few years previously. He still possessed an alert sparkle in his deep, dark brown eyes, but the friendly, ever-smiling expression of the face had given way to something more serious touched by a wistfulness suggesting sadness and reproach. His face, which had everything about it of the Nordic race except gray eyes, was now full of premature wrinkles, with deep lines under his eyes and near his mouth indicating the mental and spiritual strain through which he had passed.

Nor were the changes wrought in Einstein by his conflict with the Nazi tyranny wholly physical. The Hitler plague had done more than make him look older and sadder; it had compelled a revolutionary change in his philosophy, particularly with regard to war and pacifism, and had deepened his sympathies for the victims of injustice, poverty and persecution. Appeals to his humanitarianism induced him to desert the peace and solitude of his Princeton home, which he craved so much, and to appear in public, which he hated to do, as a violinist at charity concerts to aid the oppressed. Moreover, as the world's most renowned victim of persecution, he understood the full meaning of the tragedy and the untold human suffering which Hitlerism entailed, and he was quick to respond to the appeals of other refugees less able than himself to withstand the ravages of the Hitler lash. Distressed men and women wrote to him as if he

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were a divinity with a magic power to succor the earth's ills; they pleaded for spiritual comfort, for money, for jobs. He helped whenever he could, and as much as his limited resources permitted. A German Jew, who had appealed to Einstein as a "fellow violinist" for help to get employment, succeeded in doing so after receiving the following letter from the scientist:

"I live a very, very quiet life here in Princeton and could not help you directly to find a job. But your letter was very interesting to me—so much so that I promise herewith to write an autographic letter of thanks to any one who gives you a job for at least a month."

Another refugee, a photographer who had fled penniless from Vienna after Hitler's capture of Austria, succeeded in getting established in America after a trip to 112 Mercer Street which he had been told beforehand would be hopeless. By some good chance the scientist himself happened to be near the door just as a member of his household was about to turn the visitor away with the polite but firm admonition that it was "impossible" to get Einstein to pose for pictures.

Upon the Professor's appearance, the visitor renewed his plea to be allowed to take some pictures of the famous Einstein features.

"No, I am afraid I cannot pose for pictures," was the shy but firm answer.

"But, Professor Einstein," persisted the visitor, "you are an exile and I am an exile. I am trying to establish myself here and they told me that the only way was to do something nobody else could do."

"Please don't take it for unkindness," replied the scientist. "But there have been too many pictures of me

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already, and after all I am not a photographer's model."

But seeing the disappointed look on his visitor's face, he invited him in to chat about Germany and Austria and Nazi tyranny. And when their talk was completed, he volunteered: "After all, a few pictures more or less cannot make a difference any more, so . . . !"

One of the most frequent questions asked of Einstein was whether he had ever met Hitler. "No, but I have seen his photographs," the physicist would reply with a wink, "and they are sufficient!" Hitler's face, explained Einstein, revealed the stupidity, the fanaticism and serio-comic arrogance which possessed its owner. He expected others to notice these qualities and to cast the former Austrian corporal into limbo. But as Hitler's sway increased and a revival of the ancient doctrine that might is right caused a large part of Europe to lose the pillars of civilized human existence on which it had rested for decades, Einstein's voice began to sound again, this time from America, against injustice and moral decay, against oppression of faiths and communities and persecution of individuals, against that tyrannical autocracy which dared openly to espouse before the world the theory that "right is that which serves us"!

He urged peoples living in democratic countries to awaken to their responsibility to preserve truth and justice and to combat brutal force as a way for adjusting international differences. He saw a serious threat to civilization in the criminal activities of aggressor nations in Manchuria, Ethiopia, Spain, Czechoslovakia and China. American isolation in the face of growing international anarchy he regarded as "tragic shortsightedness." It was "unworthy" of a great nation where the traditions

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of liberty and individual freedom had their strongest roots to sit by inactively "with cynical contempt" while small republics were being annihilated by superior forces and the whole social and moral fabric of humankind was being torn asunder by lawless aggression. He warned that the breakdown of the law of international rights which all nations had joined in safeguarding in the past would have a devastating effect on all mankind and would not stop at any frontier. Cooperation for the establishment of a system of collective safety was the only means to safeguard the political freedom of the individual and to ward off tyranny.

"Suppose, for example, that the American, English, Russian and French governments insisted that Japan put an immediate stop to its war in China, under pain of a complete economic boycott," he said. "Do you suppose that any Japanese government would be found ready to take the responsibility of plunging its country into the perilous adventure of defying this order? Then why is it not done? Why must every individual and every nation tremble for its existence? Because each seeks its own wretched momentary advantage and refuses to subordinate it to the welfare and prosperity of the community. The fate of the human race is more than ever dependent on its moral strength today. The way to a joyful and happy state is through renunciation and self-limitation everywhere."

He repeated with sorrowful contempt this significant answer of a prominent American diplomat to the question why Japan was not forced by a commercial boycott to desist from her policy of force: "Our commercial interests are too strong." What can one do with people who are

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satisfied with an explanation like that, asked Einstein, who saw in the American diplomat's answer an example of the American tendency to renounce all responsibility for foreign affairs with a shrug of the shoulders which seemed to say: "Let Europe go to the dogs, if it is destroyed by the quarrelsomeness and wickedness of its inhabitants. The good seed of our Wilson has produced a mighty poor crop in the stony ground of Europe. We are strong and safe and in no hurry to mix ourselves up in other people's affairs."

This attitude of a passive spectator, declared Einstein, was bound to lead in the end to disaster all around. America, he said, was partly to blame for the difficulties of Europe. He pointed out that the economic and moral collapse of Europe, the consequent Balkanization of the entire continent, was nourished by a spirit of revenge and despair which developed from world-wide financial forces in the generation of which America played a prominent part. The United States was the most powerful and technically the most advanced country on earth, and therefore could exercise a tremendous influence in the shaping of international relations. The one-time barriers which separated nations no longer existed, Einstein emphasized, and the destinies of all countries were closely interwoven. America, he urged again and again, must join with the other liberty-loving nations in energetic resistance against the forces of barbarism. A world under Nazi and Fascist tyranny would be even worse off than the peoples of the Dark Ages, for the modern despots, while not possessing more brains than their predecessors, controlled a mighty industrial and technical juggernaut for the exercise of physical power—a physical power unscrupulously coupled

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with the mental and moral influence which they could bring to bear through their controlled schools, radio, and newspapers. Society itself would become the tool through which the individual human being would be enslaved, and mankind would become slaves chained to the chariot of Fascist despotism.

Far greater battles than any Austerlitz or Waterloo are the unseen combats that go on within the human heart; the deep lines which sprang prematurely to Einstein's face within a few years after his exile from Nazi Germany attested to the heartrending inner conflict which had converted him from an absolute and uncompromising pacifist to a "conditioned pacifist." For at sixty Einstein thought war might be justifiable to preserve the world from the crimes of war-making brigands, and declared that he himself "would not refuse military service under the present circumstances, but would, on the contrary, accept it with a clear conscience," feeling that he was helping to safeguard civilization.

"This does not mean," he told those who were surprised by a change of attitude which he himself characterized as "astounding," "that I renounce my previous opinions. I desire nothing more than to see the moment come when refusal of military service will be the means for an efficacious struggle for the progress of humanity.

"Years ago one could have hoped to fight militarism successfully by individually refusing to serve in the army. But today we are in the presence of entirely different circumstances. Since the arrival of the Fascist danger, I for the present no longer believe in the effectiveness of the absolute passive pacifism. As long as Fascism rules in Europe, there will be no peace. This despotism must

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fall if real peace is to prevail, and democracy and democratic ideals remain in the possession of the people."

In place of the passive pacifism which he had espoused for so long, Einstein urged international cooperation—what he termed an "active pacifism," which would place force at the service of a supernational law and order. He proposed as part of this plan a supernational court of arbitration. This court would differ from the League of Nations and have at its disposal a permanent military force to enforce its decisions and to render unlikely the success of the "warlike programs of political adventurers whose states are founded on violence and brigandage." Only in that way, he believed, could the threat of force on the part of aggressor nations like Germany and Italy and Japan be nullified and the ailments of the sick world corrected.

As the outlook for world peace grew blacker and blacker, with every nation straining to arm itself to the teeth, Einstein sought more and more to escape into the congenial world of research and meditation where he could fashion for himself that healing and elevating atmosphere of inner freedom and peace which the world denied him. One of the most remarkable paradoxes of his character had always been a profound love for solitude which contrasted strikingly with his passionate sense of social justice and social responsibility. This freedom from the need for direct contact with other human beings increased with the years, giving him a persistent sense of detachment and objectivity which made him sharply conscious, without much regret, of the limits of mutual understanding and sympathy between one's fellow creatures. He admitted that his lack of gregariousness was the

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cause of his losing a certain amount of cheerful bonhomie; but on the other hand, he pointed out, he was "largely independent of the opinions, habits, and judgments of one's fellows and avoided the temptation to take one's stand on such insecure foundations."

In the world of pure scientific investigation Einstein found peace. He found there that deep tranquillity which comes when reason rules the mind. In his search for that supreme universal order and harmony which he believed governed the cosmos, he found repose from the grief and strife of the everyday world. Like the weary traveler who seeks escape from the noisy, cramped surroundings of the city by retiring to the silence of high mountains, he found in solitude the serene peace and security which he could not find in the whirlpool of everyday life.

Mathematics, which had always held for him a higher beauty than he could find in any of the arts, became the source of his greatest joy in life. In that realm of strange cabalistic symbols where he was a monarch among savants, he lived with those ideals of supreme purity, clarity and certainty which appeal to every rational mind. Driven on by a passion to understand the underlying harmony of existence and reality, he regarded Nature as the realization of the simplest conceivable mathematical ideas. He was convinced that man could discover by means of pure mathematical formulae the natural laws which would furnish the key to human understanding of the universe. He pursued his mathematical tasks with the fervor of a religious devotee; and the years following his arrival in America saw a great increase in his scientific fame as he utilized mathematics and pure thought to create new pillars under his theory of relativity and to fashion new

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tools with which to attack the citadel in which were hidden the profound secrets of creation.

Einstein's lifework stood out like a Mount Everest on the plains of the Middle West and won the recognition of scientists as "the great synthetic achievement of the human intellect which sums up the mathematical and physical labors of more than 2000 years." He made noteworthy progress toward achieving a single formula that would account in one breath for Newton's falling apple, the transmission of light and radio waves, the history of the stars and the composition of matter—that would, as he himself explained in his first major paper after his arrival in Princeton, provide "a unified foundation on which the theoretical treatment of all phenomena can be based." His general theory of relativity had taken care of space and time and gravitation; but there remained the stupendous task of fitting particles of matter and electricity into the new cosmic picture. That became the goal of his work at the Institute for Advanced Study.

A preliminary report on progress toward this objective attracted a capacity throng of scientists to the auditorium of the Carnegie Institute of Technology in Pittsburgh, to watch Professor Einstein, using a piece of chalk as his only tool, picture his new concept of the universe in mathematical formulae. Although the subject of his lecture bore the forbidding title of "An Elementary Proof of the Theorem Concerning the Equivalence of Mass and Energy," thousands of disappointed visitors had to be turned away from the lecture hall, and speculators were offered as much as fifty dollars for a seat. An Einstein lecture appeared to have a popular appeal matched only by that of a major football game. A precedent of a dif-

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ferent kind was broken shortly afterward when he appeared before the Franklin Institute in Philadelphia to receive the Institute's golden medal of recognition. In accordance with custom, he was scheduled to give an address, and scientists from all parts of the country had gathered to hear it. But at the last minute Professor Einstein, with characteristic candor and simplicity, conveyed to the large audience his regrets that there would be no speech! He could not make the traditional talk, because he had nothing to say at the moment. In good Quaker tradition, he had been waiting for an inspiration, and had hoped until the last moment that it would come to him. But the inspirational goddess had been unkind. The sheepish scientist promised, however, to make amends by preparing a report just as soon as the wandering muse visited him. He kept his promise ten months later, when he sent to the Franklin Institute for distribution to the disappointed audience an "apology" in the form of an 11,000-word account of his most recent investigations to bridge the chasm which separates the infinite universe of the stars from the equally infinite universe of the atom.

Ever since the days of the cave man the human race has measured its progress by the increasing capacity of man's brain to reach out farther and take us closer and closer to Nature's eternal secrets. Although reasoning is the highest quality of the human brain, most human beings, unfortunately, think too little; we owe the forward march of civilization to the reasoning powers, not of all mankind, but of outstanding individuals. At intervals in the long course of human history some mental giant has risen who by virtue of his mind has created a new world—a genius who succeeded in giving to mankind

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a new vision of the universe in which we live. As Professor Einstein's investigations added to his renown, he won a place among the master minds of this kind. George Bernard Shaw described him, in an international radio broadcast from a gala London dinner, as one of the eight men who in the last 2500 years have "created universes" and represent mountaintops of intellectual synthesis and discovery. These eight men were Pythagoras, Aristotle, Ptolemy, Copernicus, Galileo, Kepler, Newton and Einstein. Five of these eight, explained Shaw, were, strictly speaking, "repairers," while only three, including Albert Einstein, were truly universe makers. And scientists, clutching at the new clues Einstein had given them regarding the principles that govern man and his universe, acclaimed him as "the most revolutionary scientific thinker the world has yet produced" and heaped new honors upon him.

Perhaps the most extraordinary honor bestowed upon Einstein was his adoption as a saint and a seer by one of the greatest and most beautiful Protestant churches in America. Philosophers have observed that "the way of the world is to praise dead saints, and to persecute living ones"; and there was no thought of reversing this order of things when the Rockefeller interests acquired from Columbia University the site at Riverside Drive and 122nd Street upon which to erect New York's outstanding Baptist institution. But when Riverside Church neared completion in all its magnificence, and sculptors got ready to decorate the tympanum of the entrance with carved figures of the immortal leaders of the human race, the trustees of the institution found themselves in a quandary. When Riverside Church was projected, no living person

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had been considered a possible subject for inclusion among those whose figures were to be enthroned in stone. But the trustees were confronted with the fact that one of the greatest scientists and philosophers that mankind had produced was a living man. So Professor Einstein, who had violated so many traditions himself, this time inspired a break with tradition on the part of others. The trustees of the church decided that they "could not possibly" omit Einstein from a list of the world's great, and the image of the scientist was ordered carved alongside the stone images of the angels, the philosophers and the great thinkers who had pushed humankind toward new peaks of achievement.

So the likeness of Einstein, with the easily distinguishable bushy hair framing a gentle meditative face, looked down upon the thousands of surprised worshipers who crowded into Riverside Church when it opened its doors a few weeks later. In the center of the tympanum was the figure of Christ, surrounded by symbolical figures of the four evangelists. Moses, Confucius, Buddha and Mohammed appeared in rings of the doorway arch, and such scientists and philosophers as Hippocrates, Euclid, Newton, Darwin, Pythagoras, Socrates, Plato and Spinoza surrounded the figure of the only living man on the tympanum.

"How does it feel to find yourself among the saints?" asked a friend of Einstein. With a whimsical smile, the scientist replied with characteristic humility:

"I must be very careful not to do any foolish thing or to write any foolish book, in order to live up to that distinction. I am proud of the honor, not on my account,

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but because I am a Jew. It certainly marks progress if a Christian church honors a Jewish scientist."

A public furore was created by Einstein's presence among the immortals of history over the portal to Riverside Church. Dr. Harry Emerson Fosdick, the pastor, explained in a sermon that the scientist belonged there because of his noble character and creative achievements, and because he was a supreme example of that New Testament description of the saintly: "He that doeth good is of God." Einstein was described as not only an extraordinary mind in search of truth, but also a master spirit, whose unselfish devotion to service for his fellow men was symbolic of the source of all true religion.

Einstein himself believed that he was a deeply religious man. He argued that there would be no meaning to human life without religion, and that the man who regards his own life and that of his fellow creatures as meaningless "is not merely unfortunate but almost disqualified for life." Man's unquenchable yearning for contact with the eternal and the infinite universe, his endless quest for answers to the perennial riddles: What am I? What is my origin? What is my destiny? were expressions of the religious spirit, he pointed out. Moreover, he believed that those who made researches into the very sources of existence should be most profoundly religious, and he was convinced that a feeling akin to the religious sentiments of the devout was behind all scientific work of a high order. To him this feeling of awe at the mystery of creation, this passionate faith in the orderliness and rationality of the universe represented the highest conception of God. Denominational traditions had no significance for him; and while he believed that the experience

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of the mysterious was the fundamental emotion underlying all true religion, as well as true art and science, he could not see the need for any privileged priestly class to guard the mysteries or to proclaim the authoritative revelations until they corrupted themselves along with the society they sought to dominate. His concept of religion was not shackled by creeds, by supernatural elements, or by the dogmatic sentiments of some self-styled religious leaders. Churches, rituals, codes of theological law and other common accessories of everyday religion seemed trivial to him in comparison with that nobler interpretation of religion which was rooted in a sense of wonder at the amazing universe in which we live, a feeling of rapture without which a human being was as good as dead, a snuffed-out candle.

"A knowledge of the existence of something we cannot penetrate, our perceptions of the profoundest reason and the most radiant beauty, which our minds seem to reach only in their most elementary forms—it is this knowledge and this emotion that constitute the truly religious attitude," he explained. "In this sense, and in this alone, I am a deeply religious man.

"I cannot conceive of a God who rewards and punishes his creatures, or has a will of the type of which we are conscious in ourselves. I cannot imagine a God whose purposes are modeled after our own—a God, in short, who is but a reflection of human frailty.

"That an individual should survive his physical death is also beyond my comprehension, nor do I wish it otherwise; such notions are for the fears or absurd egoism of feeble souls. Enough for me are the mystery of the eternity of life and the inkling of the marvelous structure of

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reality, together with the singlehearted endeavor for me to try humbly to comprehend a portion, be it ever so tiny, of the intelligence manifested in Nature."

The child nursing at the breast of its mother, the savage nomad gazing at the numberless stars, or the scientist studying bits of life under his powerful microscope—all may possess the religious sense. The human race has come to consciousness in its cosmic environment as a child comes to consciousness in its nursery, and so far in its long history has developed three forms of religion in its quest of the unknown. Of these, explained Einstein, two were the most common, while the third form, although traces of it could be found even among the ancients, was still a rare emotional experience which only exceptionally gifted individuals may attain. With primitive man it was fear, above all the other varying emotions, which led to religion. This religion of fear—fear of hunger, of wild animals, of sickness and death—showed itself in deeds and sacrifices intended to obtain the protecting favor of an anthropomorphic divinity on whose will and actions these fearful happenings were believed to depend. Because primitive man's understanding of causal relations was poorly developed, this religion of fear created a tradition which was handed down from generation to generation by a special priestly caste that set itself up as a mediator between the people and the beings they feared. This hegemony gave power into the hands of a privileged class, which combined priestly functions with secular authority in order to make its rule the more secure, or the political rulers and the priestly caste made common cause in their own interests.

The second source of religion, added Einstein, con-

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sisted of the social impulses of human beings—the longing for guidance, love and comfort by a Providence who protects, decides, rewards and punishes. This was the social or moral concept of God, and fathers and mothers and the leaders of human communities, conscious of their mortality and fallibility, turned to Him as the source of inspiration and comfort in sorrow and unsatisfied longing and as the preserver of the souls of the dead. The development from a religion of fear to moral religion marked a great advance in civilization, Einstein pointed out, but he emphasized that the thought that primitive religions are based entirely on fear and the religions of civilized peoples purely on morality was “a prejudice against which we must be on our guard.” The truth, he explained, was that all religions were “a varying blend of both types,” with the important differentiation that on the higher levels of social life the religion of morality predominated. Common to all these religions was the anthropomorphic character of their conception of God, and only a comparatively few individuals of exceptional endowments succeeded in getting beyond that level. Those who did, attained the third stage of religious experience, which Einstein called “cosmic religion.” It was rarely found in a pure form, though some of its experiences were common to all religions, and it involved no God made in man’s image. Those who experienced it worshiped goodness and beauty and truth. They did not believe human conduct should be motivated by fear of punishment or hope of reward. Cosmic religion called for a fellowship of mankind following the torch of human service; and its followers were ready to submerge self in the pursuit

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of an ideal, to spend oneself without measure, prodigally and ecstatically, for a great and noble goal.

Some sectarian and professional religious leaders disapproved of Einstein's religious views, while many others saw in them "a noble interpretation of modern religion and the religion of tomorrow." Undeterred by praise or blame, Einstein explained that cosmic religious sense came from contemplation of the endless beauty and the amazing harmony and order revealed in Nature, and was the noblest and strongest driving force behind the lives of men of superior intelligence.

"It is very difficult to explain this feeling to anyone who is entirely without it," Professor Einstein emphasized. "The individual feels the nothingness of human desires and aims, and the sublimity and marvelous order which reveal themselves both in Nature and in the world of thought. He looks upon individual existence as a sort of prison and wants to experience the universe as a single significant whole. The beginnings of cosmic religious feeling already appear in earlier stages of development, e.g., in many of the Psalms of David and in some of the Prophets; Buddhism, as we have learnt from the wonderful writings of Schopenhauer especially, contains a much stronger element of this.

"The religious geniuses of all ages have been distinguished by this kind of religious feeling, which knows no dogma and no God conceived in man's image; so that there can be no church whose central teachings are based on it. Hence it is precisely among the heretics of every age that we find men who were filled with the highest kind of religious feeling and were in many cases regarded by their contemporaries as atheists, sometimes also as

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saints. Looked at in this light, men like Democritus, Francis of Assisi, and Spinoza are closely akin to one another.

“How can cosmic religious feeling be communicated from one person to another, if it can give rise to no definite notion of a God and no theology? In my view, it is the most important function of art and science to awaken this feeling and keep it alive in those who are capable of it.

“We thus arrive at a concept of the relation of science to religion very different from the usual one. When one views the matter historically one is inclined to look upon science and religion as irreconcilable antagonists, and for a very obvious reason. The man who is thoroughly convinced of the universal operation of the law of causation cannot for a moment entertain the idea of a being who interferes in the course of events—provided, of course, that he takes the hypothesis of causality really seriously. He has no use for the religion of fear and equally little for social or moral religion. A God who rewards and punishes is inconceivable to him for the simple reason that a man’s actions are determined by necessity, external and internal, so that in God’s eyes he cannot be responsible, any more than an inanimate object is responsible for the motions it undergoes. Hence science has been charged with undermining morality, but the charge is unjust. A man’s ethical behavior should be based effectually on sympathy, education, and social ties; no religious basis is necessary. Man would indeed be in a poor way if he had to be restrained by fear of punishment and hope of reward after death.

“It is therefore easy to see why the churches have always

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fought science and persecuted its devotees. On the other hand I maintain that the cosmic religious feeling is the strongest and noblest incitement to scientific research. Only those who realize the immense efforts and, above all, the devotion which pioneer work in theoretical science demands can grasp the strength of the emotion out of which alone such work, remote as it is from the immediate realities of life, can issue.

“What a deep conviction of rationality of the universe and what a yearning to understand, were it but a feeble reflection of the mind revealed in this world, Kepler and Newton must have had to enable them to spend years of solitary labor in disentangling the principles of the celestial sphere! Those whose acquaintance with scientific research is derived chiefly from its practical results easily develop a completely false notion of the mentality of the men who, surrounded by a skeptical world, have shown the way to those fellow spirits scattered wide through the world and the centuries.

“Only one who has devoted his life to similar ends can have a vivid realization of what inspired these men and gave them the strength to remain true to their purpose in spite of countless failures. It is cosmic religious feeling that gives a man strength of this sort. A contemporary has said, not unjustly, that in this materialistic age of ours the serious scientific workers are the only profoundly religious people.”

Einstein was forty years old when the clamorous call of world fame first knocked at his door. Undergoing his first baptism of hero worship, he sagely predicted that his popularity would be short-lived, that there could be no permanent public interest in a man whose work was so far

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out of the ordinary lines of public interest. But he was mistaken. Einstein's theory of relativity was one of the great landmarks in astronomy and physics, but his enduring fame proved to be an equally great landmark in the field of social phenomena. Instead of diminishing, his renown increased through the years, and at sixty he found himself the only stable idol in a world of uncertainty and insecurity. His fame left his essential humanity unchanged. He was never touched by that passion for public acclaim which has gripped so many other men of prominence. The reserved humility which characterized him as a student in Switzerland was still with him in America, and he deprecated his "unearned" popularity by remarking: "My life is a simple thing that can interest no one. It is a known fact that I was born and that is all that is necessary." But a world whose imagination was stirred by this quiet unassuming man as by no other human being refused to take him at his own valuation and countless admirers joined in this poetic birthday tribute to him:

In you and your prophetic speech,
The clear voice clothed in mystery,
Once more the world is made to reach
More than the world can ever be.

There were few honors that the world could give him that were not his. Every important university had given him special degrees, his medals took up so much room that they literally were an encumbrance in his study. His portrait hung in a prominent place whenever a new planetarium or some other scientific building was opened, and innumerable college polls voted him "the world's greatest man." In recognition of "a lifetime of devoted

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service to humanity," Americans established the Einstein Medal for Humanitarianism to be awarded annually to some American who, like Einstein, was dedicated to the common weal.

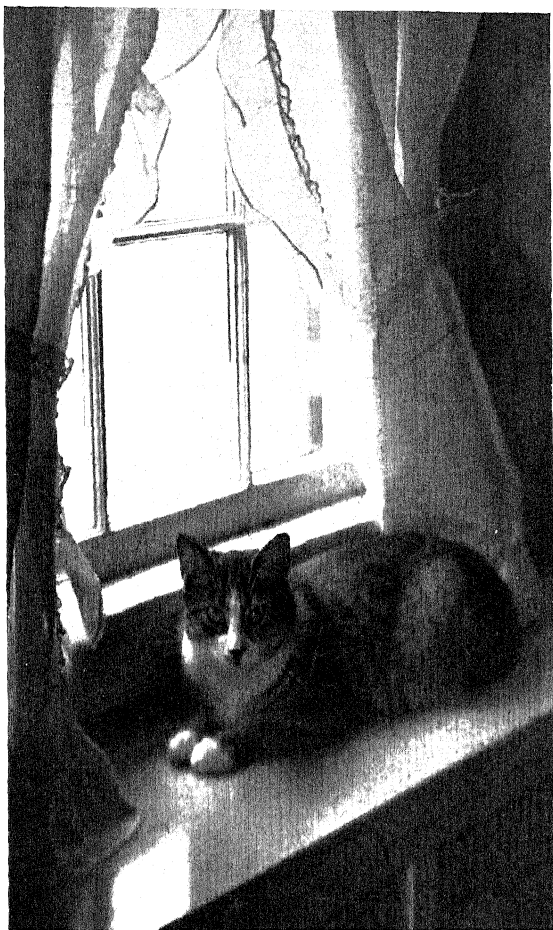
The popular demonstration attesting to his popularity took some strange turns. His judgment was sought as of an oracle on Stradivarius fiddles and on new chess theories, as well as on profound movements affecting the course of civilization; he was inveigled into pressing keys to open far-off expositions, while shoes worn by him were exhibited at a "celebrities shoe show" along with those worn by Hollywood stars, prima donnas of the opera and candidates for the Presidency. But perhaps the most surprising result of his enormous fame was the riot at the American Museum of Natural History, the only riot ever to break out in a scientific museum. An announcement that the museum would show a motion-picture film which attempted to clarify some of the less technical phases of the Einstein theory awakened some hidden volcano of public enthusiasm. On the night of the film's showing, the museum's auditorium was besieged by many thousands more than could possibly be accommodated, and the reserves of the New York City Police Department were pressed into action to halt the over-eager populace, who broke iron gates, mauled special cops, and stormed the museum's dignified interior in their mad rush for Einstein knowledge. Even hardened newspaper editors rubbed their eyes in wonder as they placed on their front pages such astonishing headlines as: "POLICE RESERVES RUSHED TO AMERICAN MUSEUM AS GUARDS ARE OVERPOWERED BY SCIENCE EN-

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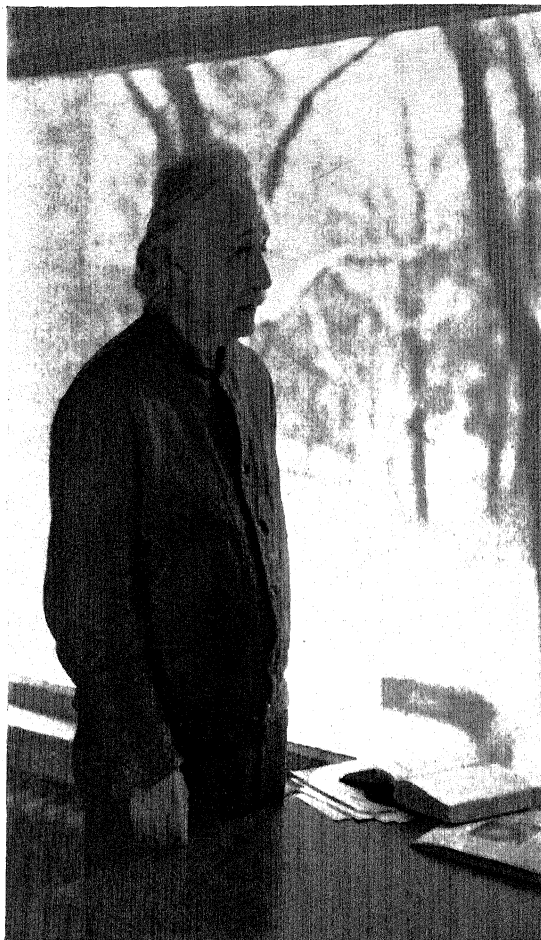
THUSIASTS" and "4500 BATTLE IN MUSEUM TO SEE EINSTEIN FILM."

This hero worship had little effect upon Einstein. Fame, he had already learned, had many handicaps, particularly in disturbing the solitude which he craved. He did his best to maintain the noiseless tenor of his own ways, but while he sought to escape from his own fame he unconsciously magnified the legendary character of his personality. He was amazed by the public acclaim of him as a great man—he himself discerned no sign of greatness in Einstein! And although time widened the gap between the days of his youth and those of inevitable old age, he never lost his child's heart. He had a quick sympathy for the problems of childhood which was born partly of his own unhappy childhood and partly from that feeling of kinship which this gray-headed child felt for other human beings who were simple and natural and unspoiled.

Thus, the boys of the Country Day School at Princeton succeeded where many an adult had failed. Baffled by a problem in algebra in their final examinations, the youngsters decided that only Einstein could answer it, and so they took it to him. The boys had been asked to find two consecutive odd numbers, the difference of the squares of which would be minus 56. What they wanted to know was whether the numbers would be positive or negative. Undeterred by the discouraging reports that Einstein would never see interviewers, they sent a fourteen-year-old youth as their emissary to the famous scientist. Einstein received the boy kindly, chatted with him for a while, and then sent him back to report proudly to his fellow students that the correct answer was "both"!



WATCHFUL WAITING
Is that the master's step?



IF WINTER COMES—

At the window of his study Professor Einstein ponders on the changes wrought by time in the seasons and in the lives of men

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At another time, a Czechoslovak who led a precarious existence as a dishwasher offered Einstein a new "discovery" which he believed was a test of the theory of relativity. The dishwasher, who dreamed of becoming a research investigator, found that lesser scientists were not willing to listen to his "crank" ideas. But he received a different kind of reception when he scraped enough money together to pay for the railroad fare to the home of the man whose name was something to conjure with throughout the world. Professor Einstein promised the young man that he would check over the mathematical calculations underlying his theory, and true to this promise he published a report in a scientific publication a few months later with this prefatory statement: "Some time ago, R. W. Mandl paid me a visit and asked me to publish the results of a little calculation which I made at his request. This note complies with his wish." Einstein was deeply sorry, but his calculations had shown that the ambitious young Mandl's theory had been based on a false premise. Another youngster, a high-school reporter, aroused envy in many a famous scientist by succeeding in getting an interview with Einstein on the subject of Nature and was able to publish in his school paper Einstein's avowal: "Nature is simple if we happen to look at it in the appropriate manner. . . . That belief is a kind of faith which has helped me through my whole life not to become hopeless in the great difficulties of investigation."

Einstein's love of Nature, which even in his boyhood days was so profound as to be akin to worship, deepened through the years, particularly after the death of his wife in December, 1936, at the age of sixty-two. Never a

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gregarious creature, the Professor had depended largely on the ministering surveillance of motherly Frau Einstein to defend him against interviewers, photographers, the curious and other self-seekers, as well as to provide that modicum of social recreation which even a scientist must have. With his wife's passing, Professor Einstein embraced solitude with greater fervor than ever before, and for companionship turned in an ever-increasing measure to the healing balm of music and to communing with Nature. He had no fondness for games—chess, bridge, and similar amusements afforded him no relaxation or pleasure. He sought rest and tranquillity of soul in the violin which he had taught himself to play, and the neighbors in the shadowy lane that was Mercer Street became familiar with the strong tone of a violin playing a favorite Bach or Mozart composition within the rambling farmhouse that was the Einstein home.

The family now consisted of three persons and a pert green-eyed kitten. Margot, his late wife's daughter by a previous marriage and a student in sculpture at Columbia University, and Fräulein Helen Dukas, who since Frau Einstein's death has looked after the Professor's bank account, his clothes, the cooking and the correspondence, were the other two members. The kitten was Margot's pet and a creature thoroughly spoiled by the Professor as well as by the two women. When the weather became warm, the household moved eagerly to some lake or seaside cottage for the summer, where Einstein, full of boyish spirits at finding himself again close to the water which he loved so much, spent a large part of every day in a chartered sailboat. At Saranac Lake, Peconic Bay, the Connecticut River, and Huntington Bay on Long

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Island's north shore, Professor Einstein in his wrinkled polo shirt and gray slacks maneuvering a sailboat with a preoccupied air was a familiar figure during various summer seasons.

He was surprised and deeply moved by the friendliness and respect which greeted him everywhere. One summer, when the Einstein household had just established itself in a cottage at the mouth of the Connecticut River near Old Lyme, the Professor, with the eagerness of a boy escaping from school, got out his sailboat and set out to test the vagaries of the currents along the Sound. On his way back, he miscalculated the minute when shallow water would make it impossible to navigate across the sandbar which at low tide blocked the haven of his retired summer anchorage. His craft became stuck. Thereupon, the author of the theory of relativity, exercising that patience for which investigators into natural phenomena are renowned, settled back to wait for the tide to turn and for the incoming rush of waters to lift his sailboat from the sands. But his plight was quickly noted on shore, and a motor boat was soon on the way to the rescue and pushed his boat off the sandbar. Profusely grateful, Einstein waved his pipe in friendly farewell, hoisted his little sail, and headed for the cove which sheltered his cottage.

It was a scene of another kind and an Einstein in a different mood that greeted Margot one winter's night as she stopped momentarily in her father's study to bid him good-night. A mantle of newly fallen snow covered the earth. The moonlight gave a silver sheen to the snow as it filtered through the shadows of ice-covered trees and bushes, and caught the figure of the high priest of science in a loose coat, a zipper shirt open at the neck, and the

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mane of fine white hair running pell-mell backward and upward over a high brow as he stood in reverie at the big window of his study quietly smoking his pipe and admiring the fairyland-like scene. The noiseless foot of time had trod down his gardens and transformed his back yard with another kind of magical beauty. This, too, would pass, and the earth would be born again with the coming of spring as time moved steadily and inexorably along its preordained and inflexible path throughout eternity. How much this ceaseless tide of time had seen and would see along its way, and how profound was its significance in human life! A few days more and he would be sixty. Ten years before, his birthday had been the signal for joyous celebration in a city which was the capital of a Republic and the good, misguided burghers of Berlin—the figure at the window could not restrain a nostalgic, amused smile at the memory—were making themselves grotesque in their efforts to give him a summer home. Now many of those men were dead, their normal lifetime cut short by a new tyranny which had unbelievably engulfed Germany and the German mind and heart and seemed headed for a new and more ferocious era of brutality on earth. The goddess of time, who had seen the birth of the German Republic, had also seen its death, and with that loss the world also had lost much of its idealism and its humanity. Years of earnest effort on the part of those who loved peace and their fellow men was turned to ashes, jungle lawlessness was winning over law and reason, and everywhere nations were arming the better to destroy each other and to turn the clock of civilization backward.

But in spite of these sorrowful memories, there was a

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look of inner peace and contentment on Einstein's face as he stood by the window of his study. That look was not born wholly of the enduring joy he derived from his work and from the serene contemplation of the majesty of Nature which comes to an investigator in a region above the troubled world, where science bestows a loftier and calmer vision born of the endless beauty and wisdom of an illimitable universe. His philosophic calm was nurtured too by the memory of a prank once played on him by Dr. Nicholas Murray Butler of Columbia University.

The two men had met at a gathering of distinguished scientists and scholars. President Butler, a cup of tea in his hand and a mischievous smile on his face, approached Professor Einstein and, after an exchange of greetings, remarked:

"You know, Professor Einstein, I have just finished reading your latest essay on the subject of time, and I am sorry to say that I don't understand a word of it. Do you?"

Startled, the gullible Einstein looked at President Butler in innocent bewilderment. Then he espied, at the corner of Butler's mouth, a lurking smile which Columbia's president could not restrain, and forgetting his embarrassment he grinned back at the joke.

"I have my own definition of time, and I want you to tell me what you think of it," President Butler persisted. "It is this: 'Time was invented by God to give man and ideas a chance to develop.'"

"Perhaps you are right," Einstein had replied, showing more breadth of mind than scientific habit.

Time, mused the man bathed in moonlight at the window, time—did it not hold the essence of human life as it did of the whole universe? Time—it would heal the

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ills of the present world—it would destroy tyrants who were enemies of the human spirit and would create new personalities who would lead an aspiring mankind on a new path of progress—it would cause order to spring from chaos, morality to replace immorality in the affairs of the world, and human fellowship to emerge from intolerance and brutality. And it was with a soft step, careful not to wake those already asleep, that Professor Einstein, confident that better times were coming and that posterity would look back upon the present era “with proud and justified superiority,” slipped off to bed.

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